



index

# PUBLIC HEALTH REPORTS

Volume 70, Numbers 1-12  
January-December 1955

*including*

PUBLIC HEALTH MONOGRAPHS

1955 Titles, Numbers 25-35



U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

MARION B. FOLSOM, *Secretary*

PUBLIC HEALTH SERVICE

LEONARD A. SCHEELÉ, *Surgeon General*



**T**HIS INDEX to *Public Health Reports* is divided into two parts: a subject and an author index.

In addition to the subject headings, categorical headings include: ADMINISTRATION, ANNOUNCEMENTS, APPOINTMENTS, CONFERENCE REPORTS, DEATHS, EVALUATION, EXHIBITS, FILMS, FRONTISPIECES, GRANTS AND FELLOWSHIPS, IDEAS, LEGAL NOTES ON PUBLIC HEALTH, PUBLIC HEALTH MONOGRAPHS, PUBLICATIONS, RECRUITMENT, REVIEWS, TRAINING COURSES AND PROGRAMS.

Titles of articles appear as entries under the appropriate subject heading, followed by the author's name in brackets. One asterisk before the page number indicates an original article; two asterisks indicate a Public Health Monograph, published concurrently with *Public Health Reports*.

Illustrative material on the inside of the front cover of each issue is indexed by month under the heading "FRONTISPIECES." It is recommended, therefore, that the covers be included in a bound volume.

A compiled annual list of Public Health Service publications may be obtained from the Public Inquiries Branch.

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# Threshold Limits

Notable progress in the establishment of reliable threshold limits, or maximum allowable concentrations, for injurious agents in the workroom air has been made largely during the past decade.

The chaotic situation that existed prior to that time is reflected in the early reports of the American Conference of Governmental Industrial Hygienists. Organized in 1937, this group was one of the first to concern itself with the development of workable, uniform toxicity guides for the provision of a healthful working environment.

In 1942, the Subcommittee on Threshold Limits of the Committee on Technical Standards presented as its first report to the conference a table of the maximum allowable concentrations established by various States for atmospheric contaminants. Values for more than 60 substances were given. Some of these substances were listed as many as three times, reflecting the different values set by the States. The concentration for nitrogen oxides, for example, was 29-70 p.p.m. in 1 State, 40 p.p.m. in 4 States, and 10 p.p.m. in 7 States.

Such variations were based in large part on very limited experience. Gradually, the accumulation of toxicological data and information based on clinical studies of exposed workers, environmental investigations, and animal experimentation has provided a firmer, broader base for the establishment of maximum allowable concentrations.

The 1954 threshold limits list of the American Conference of Governmental Industrial Hygienists presents single values for over 160 different substances. In addition, there is an accompanying tentative list of values under trial and test. Henceforth the tentative list will include all substances not previously listed.

For a review of threshold limits and other limits and tests for safeguarding the health and comfort of the industrial worker, see the paper by Dr. Herbert L. Stokinger on page 1 of this issue.

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PUBLIC HEALTH MONOGRAPH No. 25 . . . Sickness experience in  
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*Selwyn D. Collins, Katharine S. Trantham, and Josephine L.  
Lehmann.*

96 pages. A summary and information on availability appear on pages 81-82.



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Aerial view of St. Elizabeths grounds.

## St. Elizabeths Marks 100th Anniversary

St. Elizabeths Hospital in Washington, D. C., a part of the Department of Health, Education, and Welfare, marks its centennial this year.

Founded by the Congress in 1855, St. Elizabeths has grown from a set of plans which originally called for 90 beds to a community of more than 7,200 patients. Today, recognized internationally, its signal achievements include pioneer work in neuropathology, special treatment wards and special wards for legal offenders, introduction of hydrotherapy and of the use of Kraepelin's classification of mental disorders for diagnosis.

Some of the earliest American writing on forensic psychiatry started at St. Elizabeths, beginning with the work of Glueck and continuing through that of Karpman. Kempf's volume on psychopathology was written at the hospital. Several of Korzybski's early studies in semantics were made there. Its present superintendent, Dr. Winfred Overholser, is the author of "The Psychiatrist and the Law," published in 1953.

This spring, a new 400-bed treatment and admissions building, to be known as the Dorothea Lynde Dix Pavilion, will be dedicated. Miss Dix, chief nurse for the Union Army during the Civil War, was a dynamic reformer. Her efforts led to the establishment of St. Elizabeths, along with at least 30 State mental hospitals.

### frontispiece . . .

Top: Entrance to the geriatrics building—cornerstone laid in 1950. Center: Portecochere, center building. This is the entrance to the original hospital. Bottom: An old lithograph shows St. Elizabeths in the early 1860's.

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## frontispiece . . .

This 8-story building will give the Graduate School of Public Health, University of Pittsburgh, its first permanent home since its founding in 1948. The school was established by the A. W. Mellon Educational and Charitable Trust. Dr. Thomas Parran, former Surgeon General of the Public Health Service, is dean.

Preliminary plans for the structure were approved in October 1954. They include two unique features, an "anechoic" chamber and a cobalt room.

In the soundproofed anechoic chamber physicists will be able to conduct measurements of sound, hearing, and noise without troublesome interference from reflections or echoes which would otherwise invalidate measurements.

The cobalt room will provide a protected area for storage of radioactive cobalt. The

material is necessary for use in instruments which determine leakage from medicine cobalt bombs now in use in the Pittsburgh district.

The new building will be located directly below Pitt Stadium and across from Children's Hospital. It will have an auditorium capable of seating 282.

The first two floors will house administrative offices, libraries, locker rooms, lounges, and cafeteria facilities. Remaining floors will include classrooms, laboratories, and offices for the departments of biochemistry and nutrition, biostatistics, epidemiology and microbiology, occupational health, and public health practice.

The university is also constructing a new building for its School of Health Professions (medicine, dentistry, nursing, and pharmacy).

*Drawing courtesy of Eggers and Higgins,  
New York City.*

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*Published concurrently with this issue:*

PUBLIC HEALTH MONOGRAPH No. 26 . . . A history of plague in the  
United States.

*Vernon B. Link.*

120 pages; illustrations. A summary and information on availability appear on pages 335-336.



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An experience related by a Food and Agriculture Organization mission points up the World Health Day theme for 1955,

"Clean Water Means Better Health." An FAO mission was advising the Pakistan Government on a project to control and use the water of the Ganges for agriculture. One day the head of the mission bought some fish from a fisherman in the river's delta—a man who lives on and from the water.

"For payment," said the fisherman, "just give us some fresh water to drink. That and a little rice are what we need."

Dr. M. G. Candau, Director-General of the World Health Organization, stated in his message:

"Abundant supplies of clean water have always been a necessary condition for the rise of the great civilizations of history, such as those nurtured in the valleys of the Nile, the Euphrates, the Indus, the Ganges, and the Yangtze. But as these civilizations flourished, their growing population only too often poisoned the water on which their life depended.

"Although spectacular results have been achieved within the last few decades in Western Europe and North America through the improvement of water supplies and the sanitary disposal of human wastes, no country in the world can yet afford to relax its vigilance.

"We must not forget that serious and widespread cholera and typhoid epidemics were still occurring in Europe and America at the end of the 19th century. As late as 1937, a momentary breakdown in the water purification system of Croydon, near Lon-

don, resulted in a terrible epidemic of typhoid fever.

"In the immediate years following World War II, 250,000 cases of typhoid fever with 25,000 deaths were occurring annually in Europe. In Mexico in 1948, an estimated 22 percent of all deaths were caused by waterborne diseases.

"Experts believe that in many Asian countries the sickness rate could be halved by protecting water supplies and providing proper facilities for the disposal of wastes.

"There is an added need for vigilance in areas where farming methods are being modernized, industries are expanding, and populations are becoming denser. Particularly careful planning is then needed to assure sufficient water supplies for homes, factories, irrigation, and electric power, and to solve the complementary problems of the disposal of sewage and industrial wastes."

## frontispiece . . .

Men of Loma de Ramas, a village of 400 inhabitants in El Salvador, transporting pipe for a water supply line. The river crossing was one leg of their trip from the supply depot at Guazapa to the village, over 5 miles of tortuous rock-strewn road and half-way up a mountain. To get fresh, drinkable water for the village, one phase of the WHO and El Salvador general health program, the men, women, and children of the village volunteered to carry the pipes and other equipment. (*United Nations photograph.*)

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## *Published concurrently with this issue:*

PUBLIC HEALTH MONOGRAPH No. 27 . . . Roof rat population  
in southwest Georgia.

*Dean H. Ecke.*

*18 pages; illustrations. A summary and information on availability appear on pages 413-414*



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# The Papyrus Ebers

The Papyrus Ebers, dating from the first half of the 16th century B. C., is one of the earliest medical works in existence. Primarily a collection of recipes for treating various diseases and symptoms, it constitutes an important source of information about ancient Egyptian medicine. Many of the recipes are attributed to the period 2500–3000 B. C.

The document begins with invocations of the gods and recitals to be spoken when treating a patient, but it also contains between 700 and 800 prescriptions arranged according to organs and diseases, two short treatises on the heart and vessels, and a brief surgical section. Diseases are rarely described.

The prescriptions, which make up the major portion of the papyrus, include both internal and external remedies. Names and amounts of ingredients to be used are specified, and instructions for preparation are given. Drugs were boiled and strained or pounded in a stone mortar. When given as potions, they were mixed with beer, wine, milk, or water. Sometimes the drugs were formed into candy with honey or baked into cakes. Pills were made with bread dough. For ointments, active ingredients were mixed with fat.

Hundreds of substances are mentioned in the prescriptions. Metallic salts—lead, iron, and possibly antimony, for example—were recommended for treating diseases of the eyes; castor oil, colcynth, and senna were used as purgatives; ox liver was prescribed for night blindness; turpentine was one of many remedies for worms.

The treatises on the heart and vessels indicate that the ancient Egyptian physician may have known that the heart is the center of the

vascular system: "The beginning of the physician's secret: knowledge of the heart's movement and knowledge of the heart. There are vessels from it to every limb. As to this, when any physician, any surgeon, or any exorcist applies the hands or his fingers to the head, to the back of the head, to the hands, to the place of the stomach, to the arms or to the feet, then he examines the heart, because all his limbs possess its vessels, that is: the heart speaks out of the vessels of every limb." (Translation by B. Ebbell, 1937.)

Some authorities consider the Papyrus Edwin Smith, a surgical treatise written during the 17th century B. C., the only really scientific work among the several Egyptian papyri, but others regard the Papyrus Ebers as equally valuable for its information in many different fields of medicine. These papyri are a part of the accumulation of medical literature which eventually gave rise to the profession of medical librarianship, as explained in the article, *Medical Librarianship*, by Dr. Estelle Brodman, p. 473 of this issue.

The Papyrus Ebers was purchased by Professor Georg Ebers in 1873, and a facsimile edition, with introduction and vocabulary, was published in 1875. It was first translated in 1890 by H. Joachim, a German physician.

—SOURCES: *A History of Medicine*, by Ralph H. Major, 1954. *A History of Medicine*, by Henry E. Sigerist, 1951. *Medicine Throughout Antiquity*, by Benjamin Lee Gordon, 1949.

*The figure used in the frontispiece border design is from a casket panel lent to the National Gallery of Art by C. S. Gulbenkian, Esq.*

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# Milwaukee Filtration Plant

The water purification plant, owned and operated by the City of Milwaukee, is located on the west shore of Lake Michigan at the north end of Lake Park and directly east of Linwood Avenue. The site is on land reclaimed from Lake Michigan and occupies approximately 26 acres.

The purification plant is of the mechanical or rapid sand type. It has a capacity of 200 million gallons per 24 hours at a filtering rate of 2 gallons per square foot per minute. There are 32 filters, each having a capacity of 6.25 million gallons per day. When operated at the 200 m.g.d rate, there is 1 hour for mixing and 4 hours for settling.

Shown on the frontispiece are the exterior of the filter plant, a view of the ton containers of chlorine, and two of the chlorine feeding machines.

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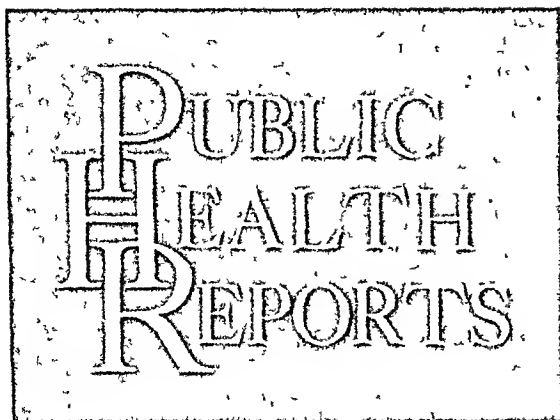
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U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

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Volume 70 Number 7

**JULY 1955**

*Published since 1878*

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*Published concurrently with this issue:*

PUBLIC HEALTH MONOGRAPH No. 28 . . . Tularemia in sheep and in sheep-industry workers.

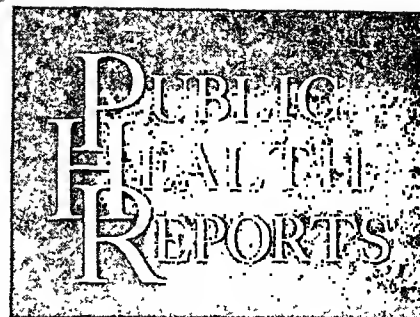
*William L. Jellison and Glen M. Kohls.*

17 pages and illustrations. A summary and information on availability appear on pages 720-721.

PUBLIC HEALTH MONOGRAPH No. 29 . . . Morbidity from cancer in the United States.

*Harold F. Dorn and Sidney J. Cutler.*

121 pages and illustrations. A summary and information on availability appear on pages 721-722.



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# PUBLIC HEALTH REPORTS

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**AUGUST 1955**

*Published since 1878*

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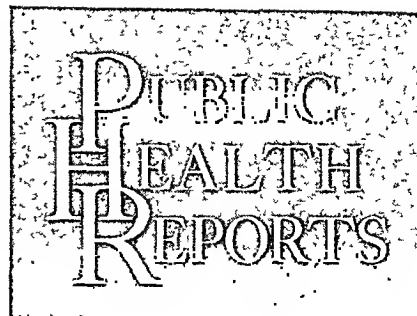
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Health of Indians became the responsibility of the Public Health Service Bureau of Medical Services July 1, 1955. (Photographs from the Department of the Interior.)



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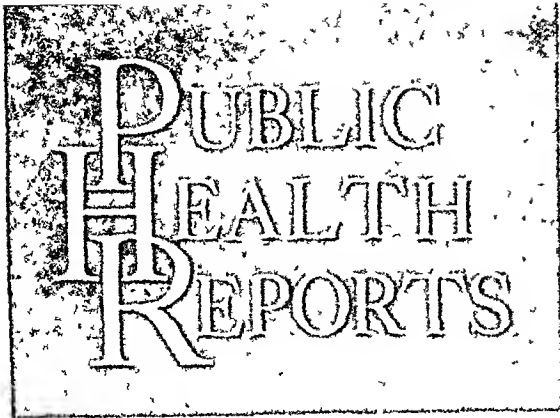
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U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

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PUBLIC HEALTH SERVICE

LEONARD A. SCHEELE, *Surgeon General*



Volume 70 Number 9

SEPTEMBER 1955

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Public health education was carried on at the University of Michigan for more than 50 years before the establishment of a separate School of Public Health in 1941 and the opening of this building in 1943.

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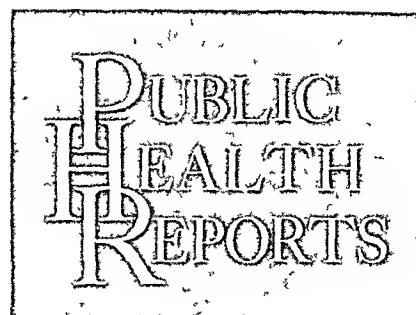
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*Published concurrently with this issue:*

PUBLIC HEALTH MONOGRAPH No. 30 . . . Major causes of illness and of death in six age periods.

*Selwyn D. Collins, Josephine L. Lehmann, and Katharine S. Trantham.*

22 pages; illustrated. A summary and information on availability appear on page 857.



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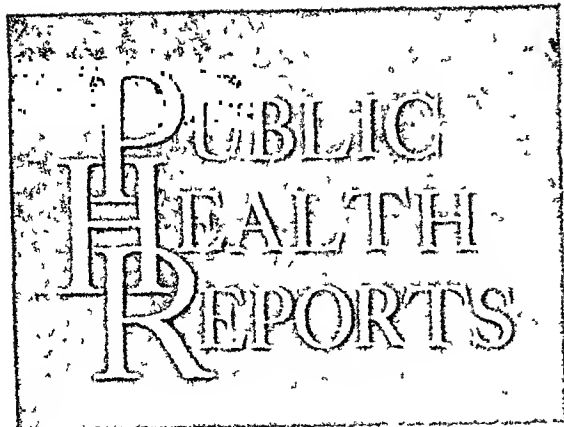
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## PUBLIC HEALTH SERVICE

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Volume 70, Number 10

**OCTOBER 1955**

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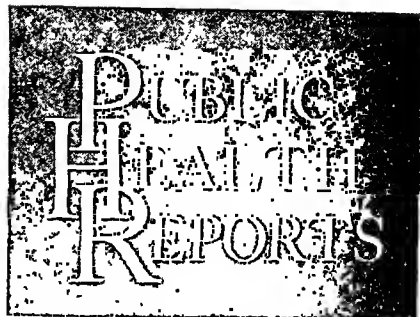
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PUBLIC HEALTH MONOGRAPH NO. 31 . . . Illness and mortality among infants in the first year of life.  
*Selwyn D. Collins, Katharine S. Trantham, and Josephine L. Lehmann.*

20 pages; illustrated. A summary and information on availability appear on page 1028.



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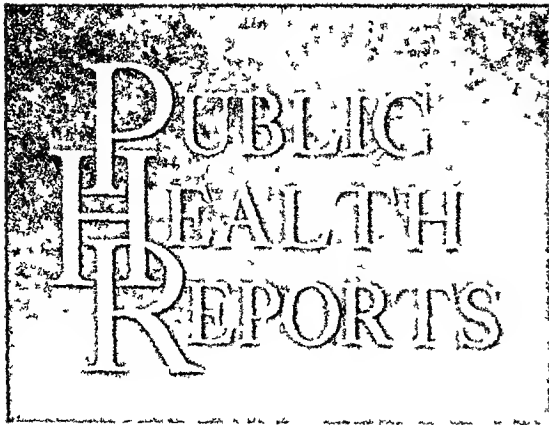
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**NOVEMBER 1955**

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PUBLIC HEALTH MONOGRAPH No. 34 . . . Housing rehabilitation and enforcement of housing laws.  
*Ralph J. Johnson and Roy O. McCaldin.*

31 pages; illustrated. A summary and information on availability appear on page 1247.

PUBLIC HEALTH MONOGRAPH No. 35 . . . A study of selected home care programs.  
*Alice M. Waterhouse, Eleanor C. Bailey, Mary C. Gillis, and Jeanne T. Palmer.*

128 pages. A summary and information on availability appear on page 1219.

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*A review of what toxicologists and industrial hygienists are doing to develop threshold limits for concentrations of substances in the air, corresponding biological threshold limits, pretoxicosis tests, and prophylactic and antidotal agents . . . and a discussion of recent developments in the techniques of air sampling and air analysis.*

# Standards for Safeguarding the Health Of the Industrial Worker

By HERBERT E. STOKINGER, Ph.D.

THE EPITOMICAL STATEMENT made some years ago by Dr. James A. Sterner, now medical director of Eastman Kodak Co. and past president of the American Industrial Hygiene Association, announced a change of attitude among industrial hygienists which today is the keynote of enlightened occupational health practice: "No substance is so toxic that it cannot be used if sufficient knowledge of its action has been made available; similarly, no substance is so nontoxic that it should be used without regard to caution."

Currently, several effective means by which such a concept may be implemented are available: (a) threshold limits for concentrations of

injurious agents in the workroom air, (b) threshold limits of concentrations of injurious agents or their metabolic products in biological fluids corresponding to the threshold limits for air (biological threshold limits), (c) tests of pretoxicosis to screen persons for early signs of injury from exposure to hazardous agents, and (d) prophylactic and antidotal agents.

Occupational hygiene standards in this country have been given various names, the most familiar of which is maximal allowable concentrations. Another designation is threshold limit values, the name used by the American Conference of Governmental Industrial Hygienists. Still another term is industrial hygiene standards, a designation recently adopted by the American Standards Association. All these terms refer essentially to the same concept of permissible contamination of workroom air by dusts, fumes, mists, vapors, or gases, although the bases on which the limits for certain substances are set may differ somewhat in the different lists. The following discussion will be confined chiefly to the list of threshold limit values, with which the author is most familiar. This list is prepared by the American Conference of Governmental Industrial Hygienists' Committee on Threshold Limits, which is composed of persons work-

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g in State and local industrial hygiene departments and in Federal industrial hygiene units, and members of the armed services in the United States and Canada.

Only the United States and Russia appear to be currently developing such lists as the threshold limits list, other countries preferring to use those already developed. Partly because of this, but more especially because the abbreviated preface to the list only briefly refers to its application, the following paragraphs discuss in some detail the nature of the list and its purpose, methods by which the values are developed, and interpretation and proper usage of the values.

### **Nature and Purpose of the List**

The threshold limits list includes those natural minerals and oils and chemical substances, including economic poisons but excluding radioactive materials, in the form of dust, fume, mist, vapor or gas, which are in sufficiently wide use industrially to warrant control of their concentration in the breathing zone of the industrial worker. (Permissible levels of exposure to radioactive materials are independently set by various radiation protection committees throughout the world. Values for many radioactive substances may be found in the National Bureau of Standards Handbook No. 52.) Because of the rapid development and application of certain chemical substances, often a time lag occurs between the industrial use of a substance and the appearance of the threshold limit value. This interval, however, is becoming shorter as a result of increasing attention of the chemical industries to the development of data on the toxicity and hazards of their products prior to use. Limiting values assigned to each substance in the list represent the maximal atmospheric concentration to which workers may be exposed repeatedly day after day without injury to health.

The purpose of the list is to provide a limiting value of air concentration for injurious substances for use by plant engineers, industrial hygienists, and others concerned with the health and comfort of the workers. The list is intended to be a guide for the control of working atmospheres and to provide management,

labor unions, and the worker alike an assurance of healthful conditions on the job.

### **Development of Threshold Limits**

A value for a toxic substance is assigned on the basis of data accumulated from animal inhalation toxicity studies and on the basis of industrial experience. Together, these represent, of course, ideal requirements not always fulfilled for each substance in the list but approximated as far as possible. Of the two, industrial experience is the test on which the validity of a value must ultimately rest. Because reliable information from industrial experience is frequently difficult to obtain, the Committee on Threshold Limits is often forced to rely on opinion of industrial hygienists, rather than on factual information, or sometimes, merely on animal data. Such opinions, however, are based on specific experience with various substances and come from occupational hygienists throughout the country. The current toxicological literature is also scanned continually for usable information. When the need for the assignment of a value seems urgent, a tentative value is assigned on the basis of the best information available at the time.

Originally, preventing impairment of health was virtually the only consideration in the selection of the proper limiting air concentration of an injurious substance. Now, however, with the increasing emphasis in occupational health on the "total man," more subtle effects on health, such as the effects of annoying or irritating agents, are also considered. Thus, whereas a threshold limit value of 3 or 4 p.p.m. for chlorine would insure no impairment of workers' health, this value is reduced to 1 p.p.m. in the interest of greater freedom from irritant effects. The levels of other gases and vapors with irritant or other discomforting effects on the workers have been similarly adjusted.

The rapid growth in the number and diversity of industrial substances to which workers are exposed and the increasing attention being given to occupational health in this country have given rise to a very real problem of maintaining the threshold limits list current. To meet this problem, the Committee on Threshold Limits reviews the lists annually, considering

carefully each value and any new information pertaining to a change in level. When a value is changed, it is so designated.

In the threshold limits list for 1954, a further accommodation has been made in an attempt to keep pace with the ever-increasing use of new industrial chemicals. This is the addition of a tentative list separated from the list of established values. Henceforth the tentative list will include all substances not previously listed. Because of the lesser certainty sometimes associated with these tentative values, they should provide only general guidance in the control of exposure and should carry no legal weight. The tentative list is looked upon as providing levels under trial and test, to be revised when new information justifies. Substances in the tentative list will not be incorporated in the main list until the values have been proved by experience to be acceptable. It is hoped that the tentative list will stimulate a greater number of yearly additions than in the past, as well as the critical evaluation of these values by greater numbers of industrial hygienists.

#### **Overall Maximal Upper Limits**

It is now considered desirable by a majority of the persons concerned with occupational health to assign a maximal upper limit of 1,000 p.p.m. for most, although not all, of the gases and vapors that are apparently nontoxic or nonhazardous. Such a limit has been set for certain Freons and other apparently innocuous substances, although it is known that neither health nor safety are endangered by exposure to far higher levels under ordinary conditions. In favor of this practice is the argument that it will prevent excessive or wanton exposure to air contaminants. It is recognized that all the facts needed to assure safety are seldom at hand. Physiologically inert substances, such as certain Freons and sulfur hexafluoride, in unlimited concentration may suddenly become hazardous, in the presence of welding or plumbing operations, through decomposition by heat to highly toxic products.

A similar concept is developing with respect to dusts that in the past have been considered

essentially nonhazardous or not incapacitating. Numerous reports from various countries make it all too apparent that many dusts formerly considered inert are capable of producing pulmonary changes that are oftentimes disabling (1-7). It would therefore seem that all insoluble dusts of whatever nature should be held suspect until proved otherwise (4). Unfortunately, the assignment of a specific level for each mineral dust is impossible at present. Mineral dusts are commonly of complex and inconstant composition, often varying according to locality, and thus are potentially capable of causing a variety of physiological responses. As a case in point, pulmonary carcinoma is commonly associated with the long-term inhalation of asbestos in England, but not in America (8). Assignment of specific levels is also difficult because pulmonary changes derived from the inhalation of mineral dusts commonly require years to assess, because sound information relating exposure to response is not, for the most part, available, because exposures are not uniform owing to changes in the industrial process and job changes, and because dusts from operations involving the same materials often differ in size and surface area.

Therefore, it is believed that the validity of the present standards for dust should be reviewed and consideration given to the following suggestions. In the absence of information and in view of the poor prospect of obtaining any in the near future, the conclusion seems inescapable that if protection from dusts is to be guided by hygienic standards, an overall limit value should be selected. Actually, two values appear desirable, one for dusts containing free silica, and another for nonsiliceous dusts.

For silica-bearing dusts, a limit of from 2 to 5 million particles per cubic foot (m.p.p.c.f.) is suggested. It would be applicable to those substances containing free silica of any appreciable percentage (10 percent or more). Such a level appears justifiable on the basis of usage and experience, as shown in table 1, and tacitly assumes no other mineral is more hazardous than silica and/or any combination of a mineral with silica. Actually, this value represents a rather low level of exposure when

expressed in terms of milligrams of substance per cubic meter of air. Depending upon particle size, 5 m.p.p.c.f. silicon dioxide ( $\text{SiO}_2$ ) with a density of 2.2 might range from 0.01 or 0.02 milligram to several milligrams per cubic foot, assuming the general size distribution of industrial dusts thus far recorded by optical methods (9); with dusts differing in density from  $\text{SiO}_2$ , corresponding differences in weight concentration, of course, would occur.

The question then arises of how best to express the dustiness of an atmosphere. Although this concerns matters too involved to be entered into here, it would seem that, with an absolute method now available for the measurement of industrial dusts, the limiting concentrations should be expressed in terms of either millions of particles per cubic foot or milligrams per cubic meter, or both, but within a definite size range, this range to be 0-3  $\mu$  diameter. Otherwise, dust counts, as well as expressions based on weight per volume of air, become meaningless. Particles of the size 3  $\mu$  and below can now be sampled and measured and are believed to be the only ones of hygienic significance. Whether the value approximating 5 m.p.p.c.f. will be found to hold when the submicroscopic particles are included is a very important project for future investigation.

**Table 1. Recommended permissible limits of some silica-bearing dusts<sup>1</sup>**

Industry or source	Reported percent free $\text{SiO}_2$ <sup>2</sup>	Recommended concentration m. p. p. c. f.
Sydney sandstone-----	90	<sup>3</sup> 6
Silica brick-----	80	2
Gold mining (Union of South Africa)-----	80	<sup>4</sup> 3
Granite-----	35	9-20
Pottery-----	30	4
Gold mining (Ontario, Canada)-----	25-35	<sup>4</sup> 8. 5
Pyrophyllite-----	30-40	10
Anthracite (hard rock)-----	30	5-10
Nonferrous mines-----	20-40	5-10
Anthracite (haulageways)-----	13	10-15
Cement-----	6	20

<sup>1</sup> From a table prepared by Theodore F. Hatch, professor of industrial hygiene, University of Pittsburgh.

<sup>2</sup> Values are approximate.

<sup>3</sup> Owens Counter.

<sup>4</sup> Konimeter.

A practical threshold limit value for non-siliceous dusts would appear to be 5 mg./m.<sup>3</sup> This value has been in satisfactory use for some years for controlling hematite dust and fume in at least one American plant (10). It would seem to represent a reasonable level of dustiness for all other presently considered "inert" nonsiliceous inorganic dusts.

### More Specific Designations

With increasing industrial hygiene knowledge and experience, refinements in designating specific substances to which values are assigned will assuredly follow. As yet, however, only a beginning has been made in this respect. For chromium, the designation specifically refers to chromic acid or to chromates. The highly poisonous arsine gas has a threshold limit value of 0.05 p.p.m., whereas the value for arsenic and its compounds is 0.5 mg./m.<sup>3</sup> Differences in toxic action of uranium compounds have been recognized by individualizing the soluble and insoluble compounds.

It would appear that manganese dioxide would be a desirable designation for manganese, because manganese dioxide is the most common industrial hazard of this element. Mercury at 0.1 mg./m.<sup>3</sup> should refer to mercury vapor and its inorganic compounds and should not imply inclusion of the more toxic organic mercurials. Similarly, for fluorides the newer organic fluorides which vary widely in toxicity and hazard should be explicitly excluded, and for selenium, the threshold limit should apply only to selenium compounds which are highly toxic, not to elemental selenium dust, which is essentially nontoxic. The value of 0.1 mg./m.<sup>3</sup> for cadmium should refer specifically to the cadmium fume, for use of this limit for most of the insoluble cadmium compounds imposes far too severe a restriction. Different levels for lead and its compounds should be specifically defined according to information accumulated in the lead industries in this country over the past 10 years. Data show that whereas there is no reason to alter the value of 0.15 mg./m.<sup>3</sup> for lead fume or for lead dust of submicroscopic size, this value is unrealistically severe when applied to the more insoluble lead salts, and probably too lenient if applied to certain or-

ganic lead compounds. These and other desirable refinements in the list will undoubtedly be made in the near future.

### Biological Threshold Limits

One new feature of occupational health standards that appears destined to play a useful role in evaluating personnel exposure in industry is what might be called biological threshold values, for want of a better term. These values refer at the present time to the greatest permissible content of an air contaminant or its metabolic derivatives in the body fluids, usually in blood or urine, although changes in other bodily constituents may in time serve also as measures of exposure. A list of biological threshold values, which correspond to the threshold limits for concentrations of the substances in air, is given in table 2. The values given for some of the substances are tentative, having been derived from limited experience; for others, such as lead and fluorine, the values are well founded. For still others, such as arsenic and mercury, there is considerable disagreement among industrial hygienists as to the usefulness of urinary determinations.

It is probable that the biological threshold limits of only a few selected substances will ultimately find an accepted place in occupational hygiene standards, since all substances are not amenable to accurate analysis in body fluids (complex organic molecules) by reason of wide individual variation in metabolism, interferences from dietary sources (arsenic); or simply the relative absence of constituents in easily obtainable body fluids (chromium, manganese, silver, and probably beryllium). For biological values to be serviceable, repeated determinations must be made on each person exposed, and preexposure control determinations are desirable. When biological threshold limits are used, they should supplement determinations of air concentrations, not replace them. In effect, these biological limits substitute diagnosis for the control or prevention of injury provided by air analysis.

Currently, in the lead industry, considerable enthusiasm is being expressed over the ap-

Table 2. Biological threshold limits<sup>1</sup>

Substance	Blood (mg./100 ml.)	Urine (mg./l.)
Inorganic constituents		
Arsenic-----		1 <sup>2</sup> (0.5 for arsine or lewisite).
Beryllium-----		0.002.
Cadmium-----		0.1.
Copper-----	0.1	
Chromium-----		Any detectable amount.
Lead-----	0.08	0.2.
Mercury-----		0.25. <sup>3</sup>
Manganese <sup>4</sup> -----		0.001.
Thorium-----		Not eliminated in chemically measurable amounts.
Vanadium-----		0.05. <sup>5</sup>
Uranium-----		0.01. <sup>5</sup>
Fluoride-----		4.
Selenium-----		0.07.
Tellurium-----		0.01.
Organic constituents		
Benzene-----		15 percent below normal sulfate ratio of inorganic to total sulfate
Bromide-----	100	
Carbon disulfide-----		0.15.
Dinitro- <i>o</i> -cresol-----		5.
Methyl alcohol-----		5-7.
Methyl acetate-----		Analyzed as methyl alcohol.
Toluene (as hippuric acid).-----		3,000.
Trichloroethylene (as trichloroacetic acid).-----		75.

<sup>1</sup> Many of the values given here are found in or have been revised from *Chemistry of Industrial Toxicology* by H. B. Elkins, New York City, Wiley, 1950, and in *Analyses of Biological Materials as Indices of Exposure to Organic Solvents* by Elkins, A. M. A. Arch. Indust. Hyg. and Occup. M. 9. 212-222, March 1954.

<sup>2</sup> H. H. Schrenk, in *New Information on Arsenic Trioxide*, Ind. Eng. Chem. 45: 11A (1953), states that urinary arsenic values of 4-5 mg./l. are commonly not associated with signs of arsenic poisoning. Use of urinary values is considered of doubtful worth because of great variation in normal values. Dietary arsenic, such as that obtained from seafoods, would greatly alter the urinary arsenic picture; moreover, arsenic is excreted chiefly in the feces.

<sup>3</sup> Urinary values may not always be reliable in long-term exposures owing to possibility of development of lower nephron nephrosis and for other reasons.

<sup>4</sup> Inasmuch as manganese is eliminated chiefly via the intestine, urinary determination is not a particularly valuable indicator of exposure.

<sup>5</sup> Tentative value.

parently successful use of urinary lead values with or without prior screening by urinary coproporphyrin determinations. The argument in favor of the use of urinary values is that in practice most industrial exposures are neither uniform nor simple, but are mixed, and, therefore, that the body serves as a better sampling device and indicator of this type of exposure than do air samples. Biological determinations also offer a guide in the diagnosis of illness not provided by air analysis. Whether it is a wise decision to allow the individual to serve as his own indicator of exposure is debatable: Derangement of metabolic function or excretion for various causes is not uncommon among working populations, especially in older age groups, and concomitant exposure to other substances or other stresses may deflect normal metabolic pathways. It would appear reasonable, for the present at least, that biological values should be accompanied by one other independent method of evaluating the working environment.

### Interpretation and Use

After the threshold limits have been accepted, it is most important that they be properly interpreted and used. Because there is some lack of agreement among industrial hygienists as to the use of the values, it might be worthwhile to consider what is meant by threshold limit or maximal allowable concentration. Confusion appears to center on the precise meaning of the term "threshold" or what constitutes "maximal allowable." These are brief terms used to express a rather complex and abstract concept which may be explained philosophically and operationally.

Philosophically, the threshold limit represents a level to which a normal healthy worker may be exposed for 8 hours each workday without harm to his physical or mental well-being. Because, in practice, most situations involve intermittent or varying exposures, the concept of the limit is that the summation of physiological effects of such exposures shall not be greater than the effect of exposure to a constant concentration at the level of the limit.

Operationally, the word limit refers to the highest permitted averaged values of an agent

in the workroom air that have been obtained in a complete cycle of operations during the day. Proper averaging of concentrations should take into consideration the duration of exposure at each concentration; this is referred to as a "weighted average." Concentrations far above the limit for periods of 30 minutes or more and prevailing sporadically throughout the day, although possibly equaling the threshold limit, are not within the intended meaning of the term. Such levels come under the classification of acute, high exposures, and suitable measures should be taken to bring such levels in line with the accepted limit. Threshold limit values are not based on high, acute levels superimposed on a persistent lower level irrespective of what value their average is.

Threshold limit values should be used as guides in the control of health hazards and should not be regarded as fine lines between safe and dangerous concentrations, that is, a point above which injury is bound to occur and below which complete safety may be expected for all exposed persons. Competent judgment is required here as in the interpretation of any standard.

### Misuse of Limits

The threshold limit values should be used only for control of exposure atmospheres for repeated 8-hour working days. They should not be used in the following ways:

1. For brief acute exposures. (The threshold limit values have been set on the basis of chronic exposures, not on the basis of brief acute exposures.)
2. For mixtures of substances. (There is no assurance that mixtures may not have potentiated and enhanced effects greater than the summated effects of each component.)
3. As levels for community air pollution or for levels to be derived therefrom by simple extrapolation. (The threshold limits have been set on the basis of an 8-hour exposure day with the assumption that a subsequent 16-hour period of nonexposure will aid distribution and elimination of the toxic agent from the body; therefore, they cannot apply to 24-hour continuous exposures common in air pollution conditions.)

4. As levels of permissible concentrations in community water supplies or for substances in solution. (Appropriate levels have been fixed specifically for several toxic elements in potable waters.)

5. As the basis for selecting dangerous compounds for labeling. (Hazards involved in handling chemicals frequently arise from routes other than inhalation, which is the basis for threshold limits.)

6. As safe limits for flight personnel in aviation. (Higher standards of safety and performance are required, and degree and duration of exposure at flight altitude differ from the degree and duration at sea level.)

### Pretoxicosis Tests

Closely related to the biological threshold values are tests of pretoxicosis, the detection of subtle metabolic changes in the body before injury of serious proportions has developed. The idea is not new, the first reported test of this sort having been applied to the hematologic reactions of prescurfism by Heim de Balsac in 1908 (11). Although the determination of pretoxic reaction is unquestionably one of the highly desirable goals of the industrial toxicologist, few such tests have been developed mainly because the mechanism of action of most toxic agents on which such tests are based is not generally known.

A pretoxicosis test for carbon disulfide has been reported by Bourguignon (12). This test is based on the change in chronaxie, which, in turn, depends upon the knowledge of the vascular and neurologic changes caused by carbon disulfide during the early stages of injury. Chronaxie, by definition, is the minimal time that an electric current of standard strength is required for the excitation of the tissue. Bourguignon's report indicates that after men had been exposed to carbon disulfide for only 2 months and before any clinical signs of disease were manifest, their chronaxie changed. Accordingly, this test permitted early detection of intoxication by carbon disulfide.

Another test of pretoxicosis that is promising although it is still in the developmental stage is the lowered cystine content of fingernails of individuals exposed to vanadium. The

lowered content occurs in the absence of any objective or subjective signs or symptoms in the workers, and it has been experimentally demonstrated in the hair of animals ingesting vanadium compounds in amounts that caused no demonstrable signs of toxicity (13). When used in combination with urinary vanadium determinations, the test appears to be highly suggestive of early metabolic changes resulting from exposure to vanadium.

The well-known urinary coproporphyrin III screening test for lead poisoning might well be classed as a pretoxicosis test. Used in combination with urinary lead values, it is now considered a reliable guide to incipient damage by lead (14). At potentially harmful body levels, lead is believed (15) to convert more of the normally occurring colorless precursor to the chromogen while increasing the total coproporphyrin of the urine.

The relative paucity of such procedures attests to the extreme difficulty of their development. Investigators should be encouraged to develop this aspect of preventive medicine, however, because its value obviously transcends that of diagnostic tests of established disease.

### Prophylactic and Antidotal Agents

As the realization of the importance of toxicology in the development and safe use of industrial chemicals has widened, more diversified groups of scientists have become attracted to its problems. Such attraction has resulted in the development of a metal complexing agent, the calcium salt of ethylene diamine tetraacetic acid (CaEDTA), for the treatment of lead poisoning (16). This chelating agent has been given good evidence of effectiveness in numerous clinical trials (17, 18), and it gives promise of considerable versatility. It has been found, for example, to be a satisfactory antidote in experimental vanadium poisoning (19) and to give promise in the treatment of essential hypertension (20). Further use of CaEDTA for the more rapid elimination of other toxic metals having the capacity to complex firmly with this chelating agent at body pH conditions will undoubtedly be made. Since the advent of BAL (2, 3-Dimercaptopropanol) for combating arsenic poisoning, no

other organic complexing agent has proved of such value, although others, such as aurin tri-carboxylic acid for the elimination of beryllium (21), have been suggested from time to time.

An ingenious and novel use of a complexing agent for combating cyanide poisoning has been recently reported (22). Cyanideless vitamin B<sub>12</sub> (vitamin B<sub>12</sub><sup>a</sup>, hydroxo-cobalamin) is capable of tightly coordinating with the cyanide ion in experimentally poisoned animals and thus preventing toxic symptoms and death.

Well-known reducing agents, such as ascorbic acid, have been reported experimentally at least to be effective prophylactically against a variety of toxic agents. For example, vitamin C was shown to function as effectively as CaEDTA against vanadium poisoning in animals (19), and this vitamin is reported (23) to reduce substantially fatal pulmonary edema and hemorrhage in animals inhaling ozone or nitrogen dioxide. Essentially complete protection against fatal ozone exposures in animals was afforded by a mixture of such reducing substances as glycuronate, cystine, and other similar substances that include vitamin C.

Two-carbon fragments administered as ethanol, acetate, and propanol have been reported to be capable of combating the highly toxic fluoracetate (1080) in animals (24), and they give promise of successful therapy for this poison. Cystine, methionine, and other sulfur-containing amino acids have been suggested as more general aids to the detoxifying capacity of the liver for protecting animals against the toxicity of 1,2-dichloroethane (25) and methylchloride (26).

Within the last few years, atropine has proved an effective antidote for parathion and other closely related organic phosphorous insecticides.

### Air Sampling and Analysis

The development of valid threshold limit values goes hand in hand with the development of accurate procedures for sampling and analysis of the industrial atmospheric contaminants.

### The Millipore Filter

Unquestionably, the greatest boon in recent years to such a development has been the introduction into the field of industrial hygiene of the Millipore filter (27, 28), known also as the membrane filter or molecular filter. This filter has an efficiency of sampling airborne particulates approaching 100 percent for all particle sizes of hygienic significance. The 150  $\mu$  thick paper of cellulose acetates and nitrates with 80 to 85 percent voids possesses a high dielectric constant and effectively attracts even noncharged particles of infinitely small size to its surface despite a mean pore size of 0.8  $\mu$ . Thus, the paper possesses a collection efficiency independent of the particle size of the aerosol. A limitation of the paper is that oils and tars clog the filter in a very short period of time, making it useless as a sampling medium for these materials.

Valuable use may be made of the property of the membrane to become transparent upon the addition of a limited amount of solvent (acetone, acetates, alcohols). This transparency permits the collected air sample to be directly counted under the optical microscope over a circumscribed, known area of the filter, thus providing a permanent dust mount that may be quantitatively analyzed.

Further advantage has been taken of the solubility characteristics of the Millipore filter by Fraser (29), who combined the high sampling efficiency of the paper and its solubility properties with electron microscopy to develop for the first time an absolute method of sampling and analyzing solid airborne particulates. In outline, the procedure consists of (a) collecting a sample of airborne particulates on the Millipore filter, (b) effecting transfer of the particles to a prepared electron microscope specimen screen after solution of the paper, (c) photographing the particles, and (d) determining the size distribution of the particles by visual measurement from their projection on a screen.

It is strongly urged that industrial hygienists take advantage of this powerful technique to explore the heretofore unsampled and unseen particles of industrial atmospheres and use such information to aid in the determination of their



industrial health significance. The results of such a study could well revise some of our concepts of the effective number of particles required to produce pneumoconiosis.

In the light of this and other recent developments, the Engineering Section of the Occupational Health Field Headquarters, Public Health Service, has undertaken an extensive reinvestigation of the entire field of dust sampling and measurement with the objective of developing improved generally acceptable methods that incorporate the advantages of these advances. Already the investigation has led to a promising use of the transparent properties of the Millipore filter, referred to above, as a dry, permanently fixed, dust sample for on-the-site use in plant or factory.

An automatic instrument which continuously records the mass concentration of dust in the atmosphere has recently been introduced (30). This instrument is based on the photoelectric measurement of forward-scattered light from solid or liquid aerosols and has a range from  $10^{-3}$  to  $10^{-2}$   $\mu\text{g./l.}$  in terms of dioctyl phthalate as  $0.3 \mu$  diameter droplets. A further modification of this device is being undertaken by David Sinclair of the Johns-Manville Research Center in the development of an instrument which will indicate the size of the particulates as well as their concentration by electronically computing the ratio of backward and forward scattered light from the particles.

Another development in dust analysis techniques is the use of the electron microscope as an electron diffracting instrument. This technique is capable of exploring the surface of particles to the depth of approximately  $0.05 \mu$  in respect to their crystallinity or lack of it. In conjunction with X-ray diffraction techniques which determine similar properties within the core of the particle, it may provide much useful information concerning the relation between the physical structure of dust and its physiological effects. At the Occupational Health Field Headquarters, such work is being done on the various forms of diatomaceous earths, and in Scotland, on various types of silica (31). Efforts along this line are expected to go far in helping elucidate the etiology of various types of pneumoconiosis.

Developments in sampling and analysis in the highly individualized field of vapors and gases during recent years have yielded no new principle or device, but rather they have found application for many of the methods long used in other fields. The study of air pollution has given a sudden impetus in this direction. Among the recent innovations used in the air pollution field are the portable Venturi scrubber (32), which has proved satisfactory for sampling ammonia, nitrogen oxides, aldehydes and sulfur dioxide, freeze-out trains, large-capacity plastic bags, silica gel, and other solid absorbents (33).

For the analysis of organic pollutants, the infrared analyzer and the mass spectrometer are being explored rather widely. Chromatographic procedures have also aided in the confirmation of many often closely related organic substances present in the air.

Automation appears to be the only really new basic development in this field in recent years. This principle has been most successfully applied to the measurement of sulfur dioxide in the form of the Thomas Autometer (34). This instrument is especially useful in situations where round-the-clock measurements are needed, or with further attachments for signaling added, it may be used successfully for control of gaseous concentrations. Automatic analyzers have also been developed for halogen analysis, for carbon monoxide (35), and for other substances. It should be emphasized that such automatic recorders in their present state of development require careful standardization and repeated attention and maintenance to assure faithful recording of actual concentrations. Commercially available recorders vary widely in this respect. If original design has been good and the instrument carefully standardized and maintained, the saving to industry over the years far outweighs the relatively high initial cost. Increasing automation is foreseen for the coming years in this and related fields of analysis and control of air concentrations of contaminants.

It may seem unfortunate that many of the recent developments in the industrial hygiene field often involve the use of equipment that is



expensive and nonportable. Immobility, but not expense, is fast being overcome when the need demands. A mobile infrared analyzer has been designed (36) and a portable mass spectrometer as well (37). High cost, a factor necessarily associated with increased complexity and sensitivity, will be slower to be overcome.

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*Copies of the American Conference of Governmental Industrial Hygienists' list of threshold limit values may be obtained from Allan L. Coleman, chairman of the Committee on Threshold Limits, Connecticut State Department of Health, Hartford 6, Conn.*

# REFERENCES

- (1) Dunner, L., and Hicks, M. S.: Bronchial carcinoma (and pneumoconiosis) in dusty occupations; Observations in boiler scalers and grain dockers. *Brit. J. Tuberc.* 47: 145-149, July 1953.
- (2) Ruttner, J. R.: Foundry workers' pneumoconiosis in Switzerland (anthracosilicosis). *A. M. A. Arch. Indust. Hyg. and Occup. M.* 9: 297-305, April 1954.
- (3) India. Office of Chief Adviser Factories: Silicosis in mica mining in Bihar. Report No. 3. New Delhi. The Office, 1953.
- (4) Marchan, D. M.: Pneumoconiosis without fibrosis. *Arch. hig. rada* 4: 402 (1953).
- (5) Martin, J. E., Jr.: Coal miners' pneumoconiosis. *Am. J. Pub. Health* 44: 581-591 (1954).
- (6) Abrams, H. K.: Diatomaceous earth pneumoconiosis. *Am. J. Pub. Health* 44: 592-599 (1954).
- (7) Smart, R. H., and Anderson, W. M.: Pneumoconiosis due to diatomaceous earth. *Indust. Med. & Surg.* 21: 509-518, November 1952.
- (8) Lanza, A. J.: Asbestosis. In Papers presented at the Fourth Conference of the McIntyre Research Association on silicosis and aluminum therapy. Norando, Canada, Norando Mines, Ltd., Jan. 1952.
- (9) Bloomfield, J. J., and Dalla Valle, J. M.: Determination and control of industrial dust. *Pub. Health Bull.* 217. Washington, D. C., U. S. Government Printing Office, 1935.
- (10) Weber, H. J.: Threshold limits of metal fumes. Part of a panel discussion at the annual meeting of the American Industrial Hygiene Association, Chicago, Apr. 27, 1954.
- (11) Heim de Balsac et Agasse-La Font: Le depistage du saturnisme latent par l'examen du sang. *Bull. Acad. Med.*, 190S, p. 1469.
- (12) Bourguignon, G.: Apparition d'altérations de la chromaxie avant toute manifestation clinique dans un cas d'intoxication sulfo-carbonée professionnelle. Introduction à l'étude des prétoxicoses. *Bull. Acad. nat. méd.* 134: 287, 289 (1950).
- (13) Mountain, J. T., Delker, L. L., and Stokinger, H. E.: Studies in vanadium toxicology. I. Reduction in the cystine content of the rat hair. *A. M. A. Arch. Indust. Hyg. & Occup. M.* 8: 406-411, November 1953.
- (14) Harold, G. C., Meek, S. F., and Padden, D. A.: A coproporphyrin III test as a measure of lead damage. Considering lead dust of relatively large particle size. *A. M. A. Arch. Indust. Hyg. and Occup. M.* 6: 24-31, July 1952.
- (15) Brigatti, L., and Graudes, C.: Sulla presenza di un precursore eterosolubile delle profirine nelle urine di addetti alla lavorazione con piombo [Presence of ether soluble precursor of porphyrin in urine in workers exposed to lead]. *Med. lavoro* 44: 113-123, March 1953.
- (16) Rubin, M., Gignac, S., Bessman, S. P., and Belknap, E. L.: Enhancement of lead excretion in humans by disodium calcium ethylenediamine tetraacetate. *Science* 117: 659-660, June 12, 1953.
- (17) Cotter, L. H.: Treatment of lead poisoning by chelation. *J. A. M. A.* 155: 906-908 (1954).
- (18) Hardy, H. L., Elkins, H. B., Ruatola, B. P. W., and Quinby, J.: Use of monocalcium disodium ethylene diamine tetra-acetate in lead poisoning. *J. A. M. A.* 154: 1171-1175, April 3, 1954.
- (19) Mitchell, W. G., and Floyd, E. P.: Ascorbic acid and ethylene diamine tetra-acetate as antidotes in experimental vanadium poisoning. *Proc. Soc. Exper. Biol.* 85: 206-208, February 1954.
- (20) Popovici, A., Geschickter, C. S., and Rubin, M.: Treatment of essential hypertension by magnesium chelate solution. *Bull. Georgetown Univ. Med. Center* 5: 108-110, October-November, 1951.
- (21) White, M. R., Finkel, A. J., and Schubert, J.: Protection against experimental beryllium poisoning by aurin tricarboxylic acid. *J. Pharmacol. & Exper. Therap.* 102: 88-93 (1951).
- (22) Mushett, C. W., Kelley, K. L., Boxer, G. E., and Richards, J. C.: Antidotal efficacy of vitamin B<sub>12</sub> (hydroxocobalamin) in experimental cyanide poisoning. *Proc. Soc. Exper. Biol. & Med.* 81: 234-237, October 1952.
- (23) Stokinger, H. E., and others: Toxicity of ozone. Report delivered at the annual meeting of the American Industrial Hygiene Association, Chicago, April 27, 1954.
- (24) Fawaz, G., and Fawaz, E. N.: Effect of metalolites on accumulation of citric acid in fluoroacetate-poisoned rats. *Proc. Soc. Exper. Biol.* 84: 680-684 (1953).
- (25) Heppel, L. A., Porterfield, V. T., and Sharpless, N. E.: Toxicology of 1,2-dichloroethane (ethylene dichloride); Its detoxication by L-cystine,

- or-methionine and certain other sulfur containing compounds. *J. Pharmacol. & Exper. Therap.* 91: 385-394, December 1947.
- (26) Smith, W. W.: Relationship between protein and sulfur-containing amino acids in protection against methylechloride poisoning (abstract). *Federation Proc.* 6: 206 (1947).
- (27) Goetz, A.: Application of molecular filter membranes to the analysis of aerosols. *Am. J. Pub. Health* 43: 150-157 (1953).
- (28) First, M. W., and Silverman, L.: Air sampling with membrane filters. *A. M. A. Arch. Indust. Hyg. and Occup. M.* 7: 1-11, January 1953.
- (29) Fraser, D. A.: Absolute method of sampling and measurement of solid air-borne particulates: Combined use of the molecular filter membrane and electron microscopy. *A. M. A. Arch. Indust. Hyg. and Occup. M.* 8: 412-419, October 1953.
- (30) Sinclair, D.: Light scattering instruments as an aid in air pollution measurements. *Air Repair* 3: 51-56, August 1953.
- (31) Gibb, J. G., Ritchie, P. D., and Sharp, J. W.: Physicochemical studies on dusts. VI. Electronoptical examination of finely ground silica. *J. Appl. Chem.* 3: 213-218, May 1953.
- (32) Magill, P. L., and others: Sampling certain atmospheric contaminants by small-scale Venturi scrubber. *Analyt. Chem.* 22: 1174-1177, September 1950.
- (33) Stanford Research Institute, Stanford University: The smog problem in Los Angeles County, 1950. Third interim report. Los Angeles, Western Oil and Gas Association, 1951, Appendix A.
- (34) Washburn, H. W., and Austin, R. R.: Continuous measurement of sulfur dioxide and hydrogen sulfide concentrations by automatic titration. In *Proc. U. S. Technical Conference on Air Pollution*. New York, McGraw-Hill, 1950, pp. 580; 556, 567.
- (35) Randall, R. A., and Hunstad, N. A.: Reliability of combustible gas alarms. Report delivered at the annual meeting of the American Industrial Hygiene Association, Chicago, April 27, 1954.
- (36) Chapman, R. L., and Torley, R. E.: Mobile infrared spectrometer for rapid on-the-spot analysis. *Analyt. Chem.* 22: 987-990, August 1950.
- (37) Miller, F., and others: Alveolar ventilation studies using the mass spectrometer. *Proc. Soc. Exper. Biol.* 74: 13 (1950).

## Community Health Week, March 21-27

Community Health Week programs are recommended for March 21-27, 1955, by the United States Junior Chamber of Commerce in cooperation with the National Health Council.

Chapters of the Junior Chamber of Commerce have been asked by their national officers to name program chairmen for Community Health Week and to seek the aid of local health leaders. The program theme is "Know Your Community Health Resources."

Voluntary organizations are recommending that their affiliates provide the programs with cooperation and guidance. Basic health services will figure in programs where local public health units work with interested members of the organization.

Interested chapters will obtain a kit of aids from the national office. Suggested activities include health fairs and forums, special newspaper coverage, television and radio programs, exhibits, and school health projects.

Program leaders may wish to consult *Guide to Health Organizations in the United States, 1951*, by Joseph W. Mountin and Evelyn Flook. Public Health Service Publication No. 196. Available from the Superintendent of Documents, Washington 25, D. C. 30 cents.

# Histoplasmin, Coccidioidin, And Tuberculin Sensitivity Among School Children In Two Texas Counties

By MICHAEL L. FURCOLOW, M.D.,  
CHARLES F. FEDERSPIEL, M.A., and  
HOWARD W. LARSH, Ph.D.

*Although the general areas of histoplasmosis and coccidioidomycosis prevalence are well known, few studies of these diseases have been made in areas where both exist. Reactors to histoplasmin and coccidioidin, as well as tuberculin, among a group of Texas school children are reported in this study.*

THE ENDEMIC areas of histoplasmosis and coccidioidomycosis appear to extend into Texas, the former from the northeast, the latter from the southwest. Observations on histoplasmin sensitivity in Texas indicate approximately 30 percent of the young adults are positive histoplasmin reactors. Among 209 lifetime residents of Texas attending the University of Chicago from 1946 to 1948, 61, or 29 percent, were found to be positive reactors to the histoplasmin skin test (1). Palmer's survey

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among student nurses yielded 21 positive reactors, 34 percent, of the 61 Texans tested (2). In a survey at Vanderbilt University, Christie and Peterson reported 7 positive histoplasmin reactors, 26 percent, among the 27 Texas residents tested (3).

These investigators made no effort to divide Texas into areas of histoplasmin sensitivity, but considered the State as a whole. The only report of a survey in a specific area is that of Forbes and Chang (4), who tested 441 infants and children in Dallas hospitals. This report showed a rise in sensitivity rates with age, reaching about 17 percent in the 12- to 15-year group. Since illness decreases skin sensitivity, it is probable that sensitivity among healthy children in this area would be higher.

In 1953, a survey of histoplasmosis and coccidioidomycosis in Texas was stimulated by the United States Army, which was concerned with the prevalence of fungus diseases in the area about Fort Hood where large numbers of men are trained. The location of Fort Hood and its relation to Bell and Coryell Counties are shown in figure 1. Tests were given only in Gatesville in Coryell County and Killeen in Bell County. These towns are at opposite ends of Fort Hood and are considered representative of the two counties. Landscape and climate are similar throughout the area.

Tuberculin tests were done also to furnish data to compare with similar surveys in other parts of the United States. In addition to the skin testing, a 35-mm. X-ray of the chest was obtained for each individual. A portable X-ray unit was used. The films were read by H. E. Smith of the Texas State Department of Health. Results of the X-ray survey are not considered in this paper.

## Materials and Methods

The study was conducted between May 4-7, 1953. Tuberculin, histoplasmin, and coccidioidin tests were done simultaneously by intradermal injection of 0.1 cc. of the appropriate antigen. The tuberculin and coccidioidin tests

were placed on the volar surface of the left forearm, and the histoplasmin test was similarly placed on the right forearm. The injections were given by teams of three experienced persons, each using a separate set of syringes and needles and each injecting a single antigen. The tests were inspected 48 hours after injection, and measurements of the transverse diameter of erythema and induration were made by two experienced readers. Reactions were considered positive if the area of induration was 5 mm. or more in diameter without regard to erythema.

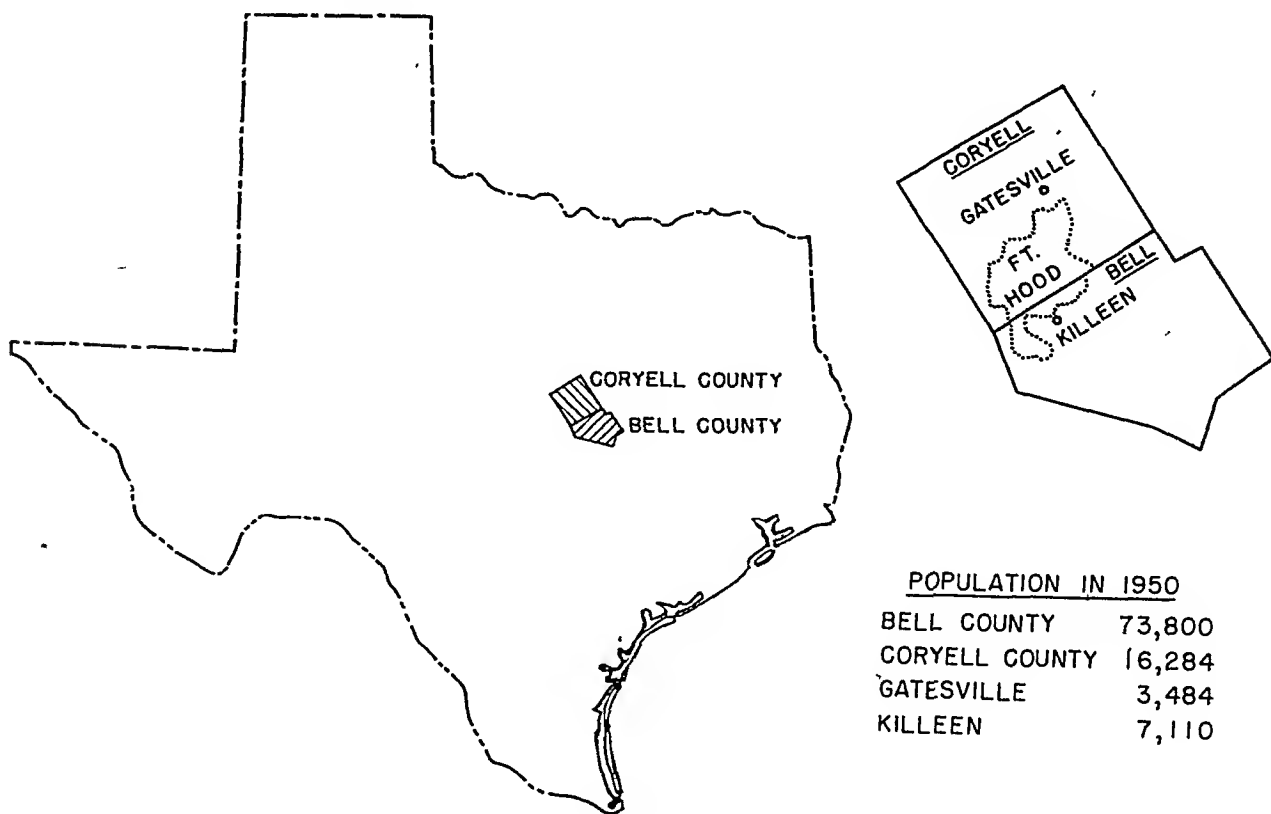
The tuberculin dosage was 0.0001 mg. in 0.1 cc. of diluent. The histoplasmin (lot IHKC-5) prepared and titrated by the methods of Shaw, Howell, and Weiss (5), was administered in a dilution of 2:1000. This histoplasmin and dilution are equivalent in potency to earlier products (1, 2). The coccidioidin was used in a dilution of 1:100.

A questionnaire, including parental consent form, was distributed to each student prior to the test. This form included identifying in-

formation, date of birth, sex, length of residence in Bell and Coryell Counties, and appropriate space for recording the results of the skin tests and the X-ray number. On completion of the survey these records were transferred to punchcards from which the desired tabulations were obtained.

Skin tests were given to 2,838 persons in the public schools at Gatesville and Killeen, Tex. Twenty nonwhite persons and 109 adults were eliminated from the analysis, leaving a total of 2,709. All of these children were considered in the analysis of the tuberculin results. Lifetime residents only were considered in analyzing the results of the histoplasmin and coccidioidin tests. Any person living at least 80 percent of his life in the Bell-Coryell County area was considered a lifetime resident. This criterion eliminated approximately half of those tested, since the children of army personnel at Fort Hood, a rather transient group, constituted a large proportion of the total school population. The data analyzed for histoplasmin and coccidioidin sensitivity, then,

Figure 1. Area of residence of persons given skin tests in Bell and Coryell Counties, Tex.



represents the indigenous population of Bell and Coryell Counties, essentially a rural area.

As used in the text, "rates" or "sensitivity rates" refer to the prevalence of positive reactors to the various antigens.

## Results

*Differences between schools.* The number and percent of positive reactors to histoplasmin in the Gatesville and Killeen public schools are shown in table 1 and figure 2. Since the towns are approximately 30 miles apart, it was considered desirable to compare the sensitivity rates. As the rates for the two schools were approximately the same, for purposes of analysis, the results from the two areas were combined.

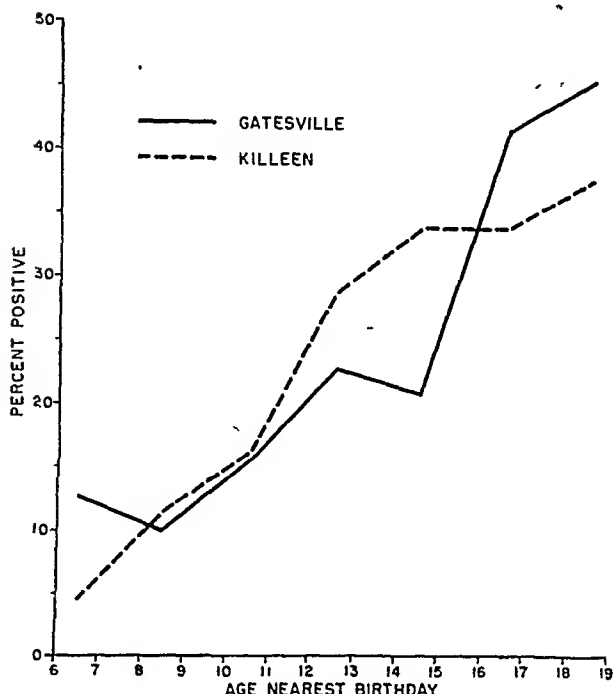
**Table 1. Histoplasmin sensitivity prevalence among Gatesville and Killeen lifetime resident public school children, Tex.**

Age nearest birthday	Gatesville			Killeen		
	Number tested	Number positive	Percent positive	Number tested	Number positive	Percent positive
6-7-----	79	10	12.7	67	3	4.5
8-9-----	141	14	9.9	131	15	11.5
10-11-----	129	20	15.5	148	24	16.2
12-13-----	101	23	22.8	139	40	28.8
14-15-----	96	20	20.8	109	37	33.9
16-17-----	53	22	41.5	115	39	33.9
18-19-----	22	10	45.5	53	20	37.7
Total-----	621	119	19.2	762	178	23.4

*Tuberculin sensitivity.* Table 2 and figure 3 show the number and percent of positive reactors among the 2,709 white children tested. The rates were relatively low, rising from 1.8 in the 6- to 7-year age group to 6.1 in the 16- to 17-year age group. There was a clear-cut rise in rates with age. The overall rate was 4.0 percent. Four of the 18 Negro children tested were positive to tuberculin.

*Histoplasmin sensitivity.* The data on the frequency of positive reactions to histoplasmin are given in table 3 and figure 3. These data, confined to the 1,383 white lifetime residents tested, show progressively increasing rates of

**Figure 2. Prevalence of histoplasmin sensitivity among lifetime residents in Gatesville and Killeen schools, Tex.**



sensitivity with age. The 6- to 7-year age group had 8.9 percent positive and the oldest age group, 18- to 19-year olds, had 40.0 percent positive reactors. The overall percentage of positive reactors was 21.5 percent.

*Coccidioidin sensitivity.* Few of the lifetime residents of Bell and Coryell Counties reacted to this antigen (table 3 and fig. 3). Although the rates were low, they were based on a relatively large sample and show a tendency to increase with age, from less than 1 to almost 3 percent. The low rates of sensitivity

**Table 2. Number and percent positive tuberculin reactors among white school children in Bell and Coryell Counties, Tex.**

Age nearest birthday	Number tested	Number positive	Percent positive
6-7-----	325	6	1.8
8-9-----	578	16	2.8
10-11-----	581	27	4.7
12-13-----	448	19	4.2
14-15-----	379	17	4.5
16-17-----	279	17	6.1
18-19-----	119	7	5.9
Total-----	2,709	109	4.0

to coccidioidin suggest that coccidioidomycosis is not endemic in this region of Texas. A number of coccidioidin reactors were noted among the "nonlifetime" residents. These occurred among persons whose major residence had been in western Texas.

*Sex differences in histoplasmin sensitivity.* The positive reactions among males and females are shown in table 4 and figure 4. The overall frequency was higher among males than females (26 versus 17 percent). This has been noted in other surveys (6, 7). However, the rates were essentially equal up to the 12- to 13-year age group. Another difference between the male and female rates was the failure of the female rates to show a marked increase with age beyond the 10- to 11-year group. In fact, the rates for females above this age were almost constant. The only rise occurred in the 18- to 19-year group, where only 29 girls were tested. The reasons for these sex differences are not known.

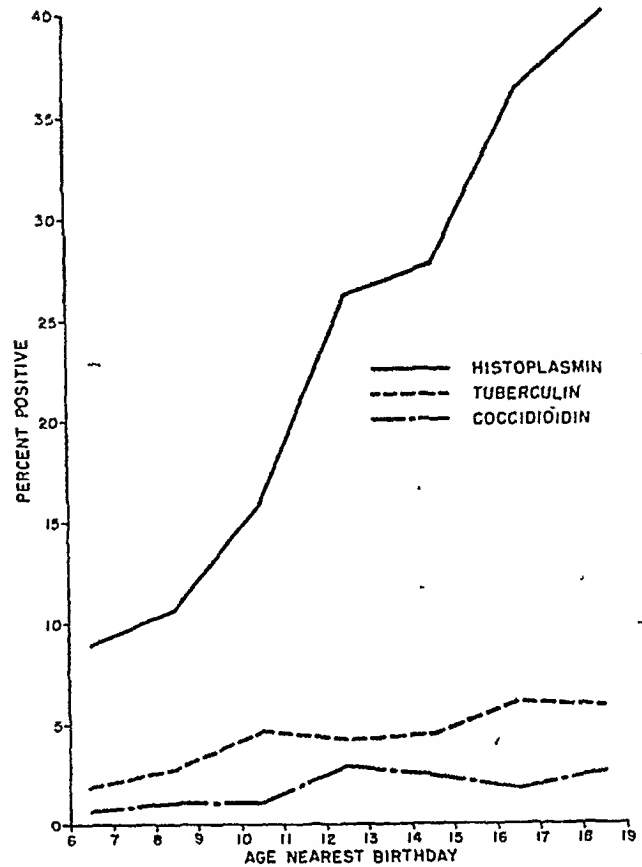
*Cross reactions.* Cross reactions in patients tested with histoplasmin and coccidioidin have been reported (8). The comparison of the size of the reaction to histoplasmin and to coccidioidin in the same children is shown in table 5. It appears that some of the coccidioidin reactions were cross reactions. This was indicated by the number of children who showed a smaller reaction to coccidioidin than to histoplasmin.

**Table 3. Number and percent positive reactors to histoplasmin and coccidioidin among lifetime residents of Bell and Coryell Counties, Tex.**

Age nearest birthday	Number tested	Histoplasmin		Coccidioidin	
		Number positive	Percent positive	Number positive	Percent positive
6-7--	146	13	8.9	1	0.7
8-9--	272	29	10.7	3	1.1
10-11--	277	44	15.9	3	1.1
12-13--	240	63	26.3	7	2.9
14-15--	205	57	27.8	5	2.4
16-17--	168	61	36.3	3	1.8
18-19--	75	30	40.0	2	2.7
Total...	1,383	297	21.5	24	1.7

<sup>1</sup> One child in this group was tested with histoplasmin but not with coccidioidin.

**Figure 3. Prevalence of histoplasmin and coccidioidin sensitivity among lifetime resident school children, and of tuberculin sensitivity in all school children, Bell and Coryell Counties, Tex.**



Many of the coccidioidin reactions were specific reactions and not cross reactions. This was clearly shown in the 52 children who reacted to coccidioidin but were negative to histoplasmin. Of these, 14 were positive reactors. In 13 other children, the reactions to coccidioidin were larger than to histoplasmin.

## Discussion

Although the purpose of this survey was to determine the prevalence of sensitivity of histoplasmin and coccidioidin, the tuberculin rates also proved interesting. The tuberculin rates among children in this rural area of Texas were surprisingly high. In comparing rates obtained under similar circumstances with the same lot and dose of tuberculin, the Texas rates were found to be twice as high as those among the suburban children in the vicinity of Cincinnati, Ohio (6). While the Texas rates appeared

to be about half as great as rates observed in Kansas City, Mo., (6) they were still surprisingly high for a rural area. These rates were not accounted for by the presence of large numbers of Mexican or Latin American children, since less than 5 percent of the children tested were of such origin. The presence of Negroes did not complicate the picture, since they were not included in the analysis.

**Table 4. Histoplasmin sensitivity prevalence according to sex among lifetime resident school children of Bell and Coryell Counties, Tex.**

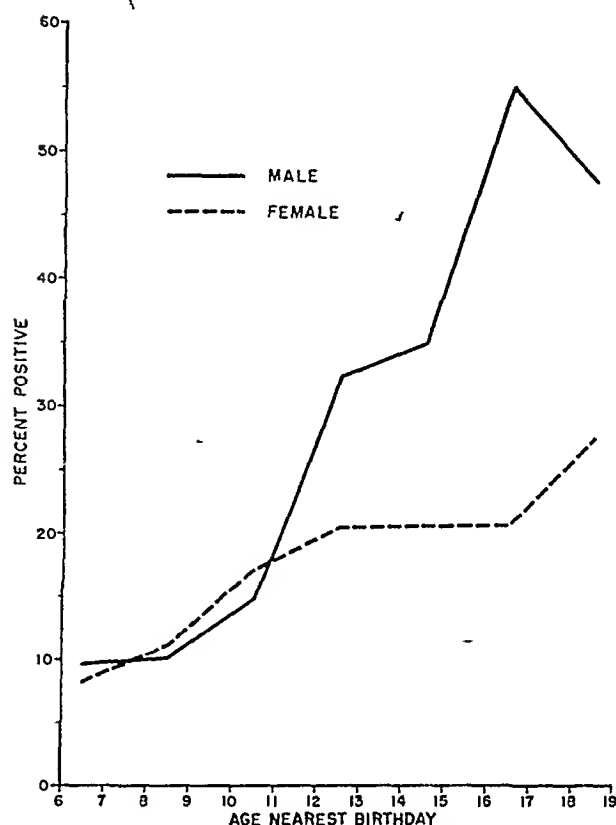
Age nearest birthday	Male			Female		
	Number tested	Number positive	Percent positive	Number tested	Number positive	Percent positive
6-7-----	73	7	9.6	73	6	8.2
8-9-----	138	14	10.1	134	15	11.2
10-11-----	149	22	14.8	128	22	17.2
12-13-----	118	38	32.2	122	25	20.5
14-15-----	103	36	35.0	102	21	20.6
16-17-----	76	42	55.3	92	19	20.7
18-19-----	46	22	47.8	29	8	27.6
Total..	703	181	25.8	680	116	17.1

The histoplasmin sensitivity rates also deserve comment. While the exact prevalence of histoplasmosis in Texas has never been determined, a number of cases have been reported from Veterans Administration hospitals, Army hospitals, and other sources.

Preliminary studies mentioned earlier (1-4) had not indicated such a high prevalence of sensitivity among lifetime residents. The fact that 40 percent of the children were sensitive at the age of 18 certainly points up the problem for physicians in this area. It might also be appropriate to mention that *Histoplasma capsulatum* was isolated from 1 of 30 soil samples taken from the Fort Hood reservation. Also, this fungus has been isolated from the soil obtained from northwestern Texas near the Arkansas-Louisiana border.

Cross reactions between fungus antigens appear to be common. This is illustrated by the results of Smith and associates (8) showing cross reactions in humans between coccidioidin and histoplasmin. Also, cross reactions be-

**Figure 4. Prevalence of histoplasmin sensitivity by sex among lifetime resident school children of Bell and Coryell Counties, Tex.**



tween histoplasmin and blastomycin in humans have been reported (6). There is some evidence of cross reactions between histoplasmin and coccidioidin in these studies as evidenced by the finding that 45 persons reacted to both tests whereas, on a chance basis, only 13 reactions would have been expected. There was also evidence of specific sensitivity to both antigens.

### Summary

Histoplasmin, tuberculin, and coccidioidin skin tests were made on 2,838 persons in Bell and Coryell Counties, Tex. Tuberculin sensitivity was found to be relatively high for a rural area. Histoplasmin sensitivity among lifetime resident school children was found to increase with age, reaching 40 percent positive in the 18- to 19-year age group, indicating a prevalence of sensitivity somewhat higher than had been expected for this area. The coccidioidin prevalence was low, which seems to

Table 5. Comparison of the size (in millimeters) of the histoplasmin and coccidioidin reactions in the same child (induration only)

Histoplasmin								
Coccidioidin	Size	0	1-4	5-9	10-14	15-19	20 and over	Total
	0	2,135	32	326	181	14	3	2,691
	1-4	38	1	15	4	3	0	64
	5-9	10	1	10	12	5	0	38
	10-14	2	0	4	5	0	1	12
	15-19	1	1	0	1	1	0	4
	20 and over	1	0	5	1	0	0	7
	Total	2,187	38	360	204	23	4	2,816

indicate that *Coccidioides immitis* is not endemic to this area.

It would appear from the known geographic distribution of histoplasmin sensitivity that the rates of reaction probably are even higher as one moves eastward from this area. Physicians in the entire area should therefore be alerted for possible cases of histoplasmosis. As mentioned above, the cases of histoplasmosis which have been reported from Texas have been confined to the large medical centers and Veterans Administration hospitals. Since the infection is generally more common in rural areas, it is probable that large numbers of cases are being missed.

The low rate of coccidioidin sensitivity in Bell and Coryell Counties is noteworthy since the endemic area of coccidioidomycosis has not been too well defined in Texas. It is well known that western Texas and the Rio Grande River Valley are in the endemic area since cases have been reported in these locations (9). However, the extension of this area to the north and east has not been well delineated. From these studies it appears that this infection is not common in the central area of Texas around Fort Hood. The reasons for the occurrence of almost 2 percent coccidioidin reactors among lifetime residents are not evi-

dent. It might be due to the presence of only a few spores in the soil or to unknown visits into the high area of sensitivity. It should be remembered also that the prevailing winds blow from western and southern Texas over this area and might conceivably disseminate the spores of *C. immitis*.

#### ACKNOWLEDGMENTS

The authors are indebted to Florence B. Seibert of the Henry Phipps Institute of Philadelphia, Pa., for the purified protein derivative (PPD-S) tuberculin and to Charles E. Smith of the University of California for the coccidioidin.

#### REFERENCES

- (1) Loosli, C. G., Beadenkopf, W. G. Rice, F. A., and Savage, L. J.: Epidemiological aspects of histoplasmin, tuberculin, and coccidioidin sensitivity. *Am. J. Hyg.* 53: 33-57 (1951).
- (2) Palmer, C. E.: Geographic differences in sensitivity to histoplasmin among student nurses. *Pub. Health Rep.* 61: 475-487 (1946).
- (3) Christie, A., and Peterson, J. C.: Histoplasmin sensitivity. *Am. J. Pediat.* 29: 417-432 (1946).
- (4) Forbes, G. B., and Chang, C. C.: Histoplasmin and tuberculin sensitivity in Texas infants and children. *Pub. Health Rep.* 68: 320-322 (1953).
- (5) Shaw, L. W., Howell, A., and Weiss, E. S.: Biological assay of lots of histoplasmin and the



selection of a new working lot. Pub. Health Rep. 65: 583-604 (1950).

- (6) Furcolow, M. L., Schwarz, J., Hewell, B. A., and Grayston, J. T.: Incidence of tuberculin, histoplasmin, and blastomycin reactors among a group of school children. Am. J. Pub. Health 43: 1523-1531 (1953).
- (7) Prior, J. A., and Allen, M. F.: Geographic distribution of histoplasmin and tuberculin reac-

tors among Ohio State University freshmen and student nurses training in Columbus, Ohio, hospitals. Pub. Health Rep. 62: 1608-1617 (1947).

- (8) Smith, C. E., Saito, M. T., and Beard, R. R.: Histoplasmin sensitivity and coccidioidal infection. I. Occurrence of cross reaction. Am. J. Pub. Health 39: 722-736 (1949).
- (9) Smith, C. E.: Diagnosis of pulmonary coccidioidal infection. California Med. 75: 385-394 (1951)

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*A cultural anthropologist suggests that examination of technological development programs of the past 20 years reveals certain empirically derived principles which have stood the test of time and which, if followed in setting the limits of community development programs, will greatly increase the chances of success.*

# Guidelines to Community Development Programs

By GEORGE M. FOSTER, Ph.D.

DURING the spring term of 1954, I participated in an informal discussion group in the University of California's School of Public Health at Berkeley.

This group, which met for six 2-hour sessions over a period of 12 weeks, was composed of faculty members and foreign and native North American graduate students, most of whom had had field experience in areas other than the United States. The foreign students—there

were four—were members of international public health organizations active in Brazil, Ceylon, and Iran. The United States participants based their remarks on their various work experiences in China, India, Southeast Asia, Mexico, El Salvador, Puerto Rico, Peru, and Chile.

The general topic of the meetings, which was never formally stated, had to do with the manner in which cultural factors bear upon the success or failure of community development programs. Though the group was primarily interested in questions of public health, it soon became apparent that public health could not be treated as an isolated problem and that the community itself must constitute the real focal point of interest.

There emerged from the deliberations of the group the conviction that, although precise rules for successful work in any geographic area, or any limited disciplinary field, could not be laid down, there were, nevertheless, certain general principles which seemed to hold good in most situations. These cannot be thought of as "principles" in the scientific sense of the word, but rather in the sense of empirically derived rules which, if borne in mind by field personnel, would contribute to the success of their programs. These rules, which constitute the greater part of this report, are in no sense new or original. They represent, rather, a summary of field experience of the discussion group, sup-

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*Dr. Foster, the former director of the Smithsonian Institution's Institute of Social Anthropology, is visiting professor of anthropology and lecturer in public health at the University of California (Berkeley). Also a member of the Health Committee on Foreign Operations Administration programs, he became active in the field of public health after making a preliminary analysis of the bilateral health programs in Latin America for the Institute of Inter-American Affairs and joining the IIAA evaluation team headed by Dr. Wilton L. Halverson. Some contemporary Latin American cultural problems and their relationship to the planning of public health programs have been summarized in the report of Dr. Foster's section of the IIAA survey as "Use of Anthropological Methods and Data in Planning and Operation." This report was published in Public Health Reports, September 1953, p. 841, as one of the Servicio evaluation series.*

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## Members of the Discussion Group

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Siri Dangalle, Unesco-Ceylon Fundamental Education Project, Ceylon.  
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plemented by the conclusions contained in a series of papers and books which have appeared over the past 15 years. They may be thought of as a "practical," "rule-of-thumb," or "working-man's" guide rather than as a theoretical statement of the principles of culture change.

Since general theoretical principles are not dealt with at length here, it is desirable to state more precisely the limits of the problem as considered by the group. Early in the discussion it was agreed that the concept of culture constituted the key to the problem. Simple definitions of culture were accepted: the common way of life shared by the members of a group, consisting of the totality of tools, techniques, social institutions, behavior patterns, attitudes, beliefs, motivations, systems of values, and the like—or, to use Linton's short definition (1): behavior and the products of behavior of a human group.

Two basic aspects of culture were found to bear directly on the problem.

First, it was agreed that any culture should be thought of as a functional, integrated whole, and not as a haphazard collection of customs and habits. If the analogy is not carried too far, a culture could be compared, it was felt, to a biological organism, in that each of its parts is related in some way to all other parts. Each part fulfills a definite function in relationship to the other parts and contributes to the normal functioning of the culture as a whole. Each part, in turn, draws upon all the other parts in some way for its own continued existence, and its growth and development are dependent on corresponding growth and development in the culture as a whole.

To illustrate this concept of integration in terms of public health, it was pointed out that preventive medicine and sanitation projects are not isolated parts of the life of a people. They are related to education, economic productivity, distribution of income, social security, municipal administration, philosophical and religious premises, and a host of other things. Changes in the level of health in any given region may result from improvements or changes in these aspects of culture. Conversely, changes that can be brought about by planned action are limited by, and dependent on, the changes that simultaneously are occurring, or can be made to occur, in these related aspects.

Second, the group recognized that all cultures are capable of change and that all cultures are constantly changing, whether the pace be rapid or slow. It was agreed that there are definite, though unfortunately imperfectly understood, rules of human behavior which govern the processes whereby changes occur. In general, there appear to be two basic types of culture change: One may be called "spontaneous," or perhaps "evolutionary," in that the change happens without the conscious efforts of individuals or groups, and the other may be called "directed," or "guided," in that group planning and action leads to goals which, it is thought, will promote a happier, healthier, better educated, and independent society. All community development work, regardless of type, clearly falls in this second category.

Obviously, directed culture change is, in the broad sense, not new. Wars of conquest, economic development of societies and geographic regions, missionary activities, democratic community organization for civic ends, the efforts of the fathers of the American Revolution, all fall into this category. But, in recent years, certain types of guided culture change have swung into sharper focus. Though the term is now officially obsolete, "Point IV type programs" conveys the idea in fewest words. Regardless of sponsorship, the thought is that through a combination of outside and self help the economic and emotional security of those people of the lower social and income strata, wherever they may live, may be advanced. The problems often are more acute in those countries of slight economic development, as contrasted with the more highly industrialized areas, but the question seems to be one of degree and not of kind. One of the most interesting facts to develop from the discussion group was that the problems—and the means of attacking them—that applied to foreign countries were believed by those who had worked principally in the United States to reflect local situations to a surprising extent. That is, the rules for successful work in, let us say, Latin America, are also good rules to apply in the United States.

A particularly difficult question underlying directed culture change programs is that of "values." Who determines the needs and rights of a people? Who decides what is best, what should be done, what habits should be changed? In general, it was agreed that all such goals should be a function of the culture in question and not a reflection of the goals and attitudes of the outside countries sending the specialists. Though the discussion group considered the matter of values, for purposes of outlining rules of work, the question was begged. It was assumed that through research and careful thought, and through consultation and planning among all interested governments, goals could be determined which are consistent with the felt needs and aspirations of the people to be affected.

The problem then became one of determining the most practical methods to be used in field

operations. There was general agreement that the 12 rules listed and discussed below, although not constituting an exhaustive list, seem to hold true in a majority of cases.

The 12 points suggested do not constitute a guide to any specific type of program—health, agriculture, or education. The list does not include all the things that the program planner and director should bear in mind, nor do all of the points necessarily apply in a given situation. Any specific problem must be thought of as a more or less unique phenomenon, although it will, of course, have much in common with other similar problems. Many of the general principles suggested here will apply, but they are no substitute in themselves for thorough and accurate community analysis before a program is completely planned and initiated.

#### 1. *Know the culture in which work is to be done*

Since the idea behind directed culture change is to change or add to something already in existence, it is apparent that we must know what the "something" is before an attempt to change it is considered. There are, unfortunately, no short cuts to learning a culture. It is work that takes time and patience. And, in most cases, it is best done by a trained cultural anthropologist or sociologist who is familiar with the projected action goals and who bears in mind the data needs of the administrator but who, nevertheless, ideally works toward a full picture of the culture. This is a point that is sometimes hard for the administrator to understand. The reason is that in the beginning it is often impossible to know what significant factors bear on any concrete project. An obscure point in the prestige complex of a people may, for example, hold the key to the successful introduction of pit privies; or the supernatural beliefs of a people with regard to seed corn may be the determining factor in preventing the introduction of a hybrid variety.

Although at the present time there is great need for thorough basic studies in all cultures, the problem of acquiring the necessary insight will become easier as time passes and knowledge is accumulated. Although each country, and

each village, is different in some ways from all others, nevertheless, all villages in an area and most countries in a region share a majority of their basic culture patterns. This means that when a series of selected studies has been completed it becomes possible to infer a great deal about the basic patterns in other unstudied areas; that is, the basic underlying patterns hold true over wide areas. Once these patterns are worked out, the research problem then becomes one, in any specific locality, of isolating the specific factors that are unique to the locality, and relating these factors, as well as the underlying patterns, to the immediate project.

For example, cultural anthropologists and rural sociologists have, over the past 25 years, made a series of basic studies of contemporary Latin American culture. Although the picture is far from complete, enough of the basic patterns have been isolated so that when a specific project was outlined it was possible to acquire significant data in a surprisingly short time because the field workers built on the accumulated scientific capital of 25 years of work. Hence, if we are correct in assuming that directed culture change programs are just beginning a period of enormous expansion, it is particularly important to urge that active support be given to long-range basic cultural analyses.

## *2. Select the site of operations with extreme care*

Paradoxical as it may sound, at this stage of our knowledge it is usually wise to select a community which, through past progress and a progressive spirit, gives indications of future progress. All too often, program sites have been selected on the basis of the absolute poverty of a people, of their crying need for help. To select communities that are somewhat better off, it is argued, would reflect a fundamental disregard for humanitarian principles. Communities in all parts of the world tend to fall into progressive and conservative categories. The factors that underlie these differences are not well understood, but it does not take extensive investigation to determine, in any locality, the order of rating of all groups. Usually, the people of a community know where they themselves fall. Factors which may often underlie a progressive community, and which

therefore make it a favorable one in which to commence work, include a relative lack of social cleavages, a reasonably stable economic basis, the characteristics of a population that is not too marked by transients or one in which political dissensions are not extreme, and so forth.

So little is known about the requirements for successful directed culture change that failure may result, even under apparently ideal circumstances. Too many otherwise sound projects have been doomed to failure before they were begun simply because the most difficult site possible was selected. Once a certain success has been obtained in a community, once the confidence of field personnel to cope with the local situation is established, once the specific problems of operation of a given locality are solved, then it is possible to work in the socially and economically more retarded communities. Often the successful example of a progressive village will spell the difference between success and failure in adjacent neighborhoods.

## *3. Pay first attention to selection of the program staff*

The delegating of authority to individuals temperamentally and scientifically unsuited to the work they are to perform has caused as many failures, perhaps, as any other single factor. It is better not to start a program than to attempt to push it through with unsuitable personnel. Perhaps failure to pay adequate salaries is the biggest single shortcoming in selection of personnel. Reasonably high pay is essential for at least two reasons: to attract persons of sufficient education and intelligence to understand thoroughly the problems involved; and to give personnel sufficient prestige and status within their own bureaucratic organization so that they identify themselves with the goals of top level management, rather than letting them feel that they are underpaid and unesteemed flunkies. Personnel must command the respect equally of their superiors and of the people among whom they work.

## *4. Regardless of long-range hopes, start with a simple project that shows obvious results in a short time*

It is difficult, if not impossible, to maintain unflagging enthusiasm on the part of local peo-

ple if results are not quickly apparent to them. The local leaders who identify themselves with a new program, and who push it among their fellows, threaten their own position in the community when they cannot demonstrate results within a reasonable time. Frequently, the best local cooperators have been lost, and perhaps their active opposition has been incurred, simply because results could not be shown or perhaps because outside promised aid, on which they counted, was slow in making its appearance.

It is quite legitimate to use "bait" projects if necessary—projects not directly associated with long-range goals, but which represent felt needs of the people and which arouse their interest. Whatever the initial projects, avoid those heavily charged with emotional factors. Since the emotional charge varies enormously from culture to culture, it is apparent that sound basic knowledge of the local group is essential to avoid possible mistakes here.

5. *Take advantage of the pragmatic nature of people*

This rule is closely related to the preceding one. The most striking fact to emerge in recent studies of directed culture change is that people are pragmatic to an unexpected extent. If with their own eyes they can see results that they recognize as beneficial to them, regardless of their understanding of the reason, regardless of tradition and superstition, regardless of factors that might otherwise cause them to hold back, most people will give up the old and adopt the new. The problem, of course, is the means of convincing people that something is beneficial to them.

In general, a striking demonstration of the new is a positive way of changing behavior. In some areas this is easy. Malaria and yaws control programs, for example, quickly convince. Smallpox control is more difficult to prove, since success is less spectacular. However, if a striking demonstration can be made in any area of culture, the confidences established in the innovators may often be utilized to effect changes in areas where demonstration is difficult, if not impossible. Or, in other words, proof in one area will lead people to take other statements on faith—faith that would not

be forthcoming without the original demonstration.

In one South American city, for example, the visual success of an emergency whooping cough inoculation program in stemming a threatened epidemic was sufficient to assure the active cooperation of mothers in a subsequent BCG tuberculosis campaign.

But simple, unspectacular demonstrations are also important in many projects. To illustrate: If it is desired to introduce a new food, it is essential to show by demonstration all the steps in its preparation. Food and its preparation diffuse as a unit. It is not sufficient to give people the new food and expect them to cook it according to one of their traditional ways.

6. *Don't ask people to do anything they fear may threaten their already narrow margin of material security*

The poorest farmer is not the one who will first try an improved seed, no matter how desperate his need. However precarious his situation, from past experience he at least knows the dangers and limitations inherent in his traditional methods; he knows what to expect and can lay his plans accordingly. He is not apt to risk this narrow, but predictable, margin of known security by taking a chance on the say-so of an outside stranger. The poorest and busiest mother with the most sickly children is not the one who can afford to stand in line long hours in a health clinic to have a child examined. In general, most progress will be made if a target group is selected that lies somewhere between the lowest and highest extremes of social and economic status. Once progress is demonstrated with this target group, the obvious benefits will diffuse both upward and downward.

7. *Think in terms of the economic and social potential of the community—not in terms of an ideal program*

In the long run, any new program will have to be carried in large measure by the people themselves. Overplanning, in the sense of the "best" program for, let us say, a small rural center, may burden its citizenry with economic and maintenance commitments which would only be consistent with the growth of a prosperous industrial community.

#### 8. *Aim at integrated, broad programs*

Insofar as is possible, it is usually advisable to think in terms of total community development rather than in terms of a single field of endeavor. In the first place, broadening a program spreads capital investment more widely, thus lowering unit costs. In the second place—and even more important—no type of project operates in a vacuum. A sound health program, as pointed out, depends on good agriculture, education, honest and efficient civic government, and an economic surplus. Good farming depends on healthy and informed workers, and good government requires all of these underlying factors, and many more. There are, admittedly, many practical problems that interpose themselves between the desire for a broad program and its realization; and special local situations will sometimes mean that it is impossible or unnecessary to conduct a program on a broad basis. Nevertheless, as a general goal, this aim seems valid.

#### 9. *Follow the right sequence in a program*

All community programs represent continuums in time. Each project of a major program must be adapted both to the other projects and to the general cultural setting, not only as of a given date, but also in terms of time depth. When the factors that bear on the relationship of a given project to other projects, and to the culture at large, are known, then its place in the sequence of projects can be better determined. For example, reading rooms and books should not be introduced into a community until such time as the ability to read has become an accepted value by at least a significant part of the group and until this part is clamoring for knowledge. Or again, undue stress on preventive medicine in public health programs will meet with little success until the immediate felt need of curative medicine is at least partially satisfied.

#### 10. *Use existing community leadership whenever possible*

In general, the evidence indicates that existing community leaders working through existing community institutions, such as church, government, school associations of fathers or mothers, and the like, constitute the most effective

way to get action. Individuals who are poorly adjusted to their own cultures and whose discontent often quickly brings them to the side of outside innovators, will not, in most cases, be leaders who can aid a project. It is important to recognize the distinction between formal and informal patterns of leadership. Both patterns have their place in community development. Unfortunately, our knowledge of the structure of leadership in many parts of the world is rudimentary and much research on this problem seems indicated.

#### 11. *Avoid local commitments against a project*

Every effort should be made to obtain the cooperation of as many people as possible before they go on record as opposing the project. There are almost always people in each community who are only too anxious to express themselves negatively, particularly if their advice has not been asked. Once committed publicly against a project, it is very difficult for them to change their stand, since it will mean a possible loss of "face." If positive cooperation cannot be elicited, at least try to promote a neutral attitude.

#### 12. *Require payment for certain services*

A great deal of evidence suggests the wisdom of charging at least a token sum for many types of health, agricultural, and educational services. In many parts of the world, the fact that something is given away carries a strong implication of worthlessness. Even a small payment, adjusted to the ability of the recipient to pay, will often create an awareness of value and will elicit cooperation, where the same service or item given free would be ignored or thrown away. To illustrate: In an agricultural extension program in a South American country, it was found that if fruit trees were given to farmers, the farmers usually failed to plant them. When a small charge was made for the same trees, the farmers' interest was heightened, more trees were planted and cared for, and the overall results were more satisfactory.

#### REFERENCE

- (1) Linton, R : The cultural background of personality. New York, N. Y., Appleton-Century-Crofts, Inc., 1945, p. 32.



# Dining Car Sanitation in the United States

By WILLIAM H. MEGONNELL, M.S., and EDMUND C. GARTHE, C.E., M.P.H.

ONE of the most striking features about dining cars is that while they resemble restaurants they are, at the same time, very dissimilar. True, the dining car is simply a special kind of restaurant—a restaurant on wheels, not differing in other essentials from other establishments where food is prepared and served. Dining cars and restaurants purchase the same kinds of food and prepare and serve them in the same manner, employing the same kinds of people. However, the one essential difference—mobility—creates problems which are peculiar to dining cars. It is one thing to supply and operate a stationary restaurant and quite another to supply and operate a restaurant that traverses hundreds of miles of railroad track.

A dining car superintendent has to anticipate and cope with seasonal peak loads and plan for large special movements of passenger traffic, such as are associated with military or emergency activities. Add to this the possibility of breakdowns, accidents, and other contingencies, and it is apparent that a sizable pool of fully equipped cars and trained personnel must be kept in reserve for such circumstances. This

is tantamount, if it can be imagined, to a large restaurant chain's keeping idle several expensive restaurants which are opened for business only during occasional rush periods.

The relationship between travel and the spread of disease has been recognized for centuries. Many hundreds of thousands of people in the United States travel on trains every day. About 80 million meals are served in dining cars each year. Thus, the fundamental rules of food service sanitation for preventing the spread of disease apply equally to dining cars and restaurants.

Since dining cars are rolling restaurants which cross State boundaries, their sanitary control is clearly a Federal responsibility. Indeed, it would be almost impossible to control them otherwise. The multiplicity of State and local health requirements and the variations in inspections by different health departments would result in intolerable confusion to carrier companies. More important, attempts by a State or local health department to follow through on an inspection or to investigate a disease outbreak attributed to food or drink consumed on a diner would be so complicated, after the conveyance had traveled into another State, that the efforts largely would be futile. Even negotiations between a health department and a railroad company would be difficult and complicated if the carrier's headquarters were located in another State (1).

Interstate quarantine authority was given to the Public Health Service by an act of Congress approved February 15, 1893 (2). This action was taken because of the continued presence of yellow fever during the summer months in the southern States. It was believed that the interstate railroads were a big factor in

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transmitting the disease from one State to another.

The interstate quarantine regulations, promulgated under the 1893 act and effective September 27, 1894, were the first concerted attempt to deal with the interstate spread of disease. These regulations have been revised and amended from time to time, most recently in 1951, to take cognizance of new developments in health and technology (3, 4).

### Development of Diners

In the earliest days of railroading, before the advent of the diner, passengers had to depend largely on their own ingenuity for sustenance during a journey. The hardier and more resolute individuals risked the "eat-and-run" meals available at station stops; the less hardy or more discriminating resorted to carrying "shoebox" lunches. Both resources had obvious disadvantages. The food available at many stations in those days was generally stale and unsavory, while cleanliness and sanitation were questionable, at best. Lack of refrigeration and the presence of dust, soot, and insects often destroyed the appetite—and sometimes the health—of those who carried their lunches. The remaining choice, which many passengers took, was to go hungry (5).

Eastern railroads improved the intolerable situation by better surveillance and supervision of existing establishments. In the west the problem was more basic than amelioration because there were few restaurants of any sort. However, in 1876, a young railroader with the firm conviction that the traveling public would appreciate and generously reward anyone who began the reformation of the lowly railroad eating house established the first of what were destined to become famous station restaurants (6). Some of these exist today. His high standards of cleanliness, excellent cuisine, efficiency, and service developed into an art which became the model for such establishments and doubtless influenced the quality of railroad dining service.

Technological progress of the railroads and demands of the speed-conscious public who objected to meal stops made inevitable some form of service en route. The first recorded at-

tempt to provide food aboard trains was made in 1862 by the Camden and Amboy Route, which converted a baggage car into a diner for use on its Washington express. The following year, the Philadelphia, Wilmington & Baltimore Railroad remodeled two day coaches for service as diners between Philadelphia and Baltimore. In 1867, George M. Pullman introduced "hotel cars," which were sleeping cars equipped with kitchen and dining facilities. The first full dining car was built by Pullman in 1868 for the Chicago & Alton Railroad (5).

Regarded at first as somewhat of a curiosity, dining cars were enthusiastically received by the traveling public, but they did not come into general use until the late 1800's, no doubt as a result of the intense railroad competition during that period. Dinner in the diner became as much a part of the romance of railroading as the familiar click of the wheel on the track. As the shoebox lunch gradually disappeared the dining car became the real heartbeat of the train and the showcase of the railroads.

Although the Public Health Service was charged with the control of sanitation on dining cars, other important duties and budgetary and personnel limitations made an aggressive program impossible. So for many years governmental inspection and supervision of sanitation on dining cars were sporadic. All commissioned officers of the Service were under orders to inspect dining cars while en route on trains on official business; occasionally, surveys of entire roads or of all dining cars entering a railroad center were conducted as the result of a complaint; but there was no continued, routine program for such work.

However, from the beginning the railroads set high standards for their dining car service. Gleaming tableware, spotless linen, immaculate and courteous waiters, gracious stewards, and tasteful decor—all of these contributed to the dining car's unique atmosphere.

### The War Emergency

During and immediately after World War II, uncontrollable emergency conditions precluded the exactitude formerly devoted to the comfort of the traveling public. Warworkers and servicemen were on the move, often with their fami-

lies, traveling from one section of the country to another on an unprecedented scale. The heavy increase in wartime rail travel came when railroads were unable to purchase new equipment. At the same time well-trained employers were off to war or to more lucrative jobs, forcing dining service managers to employ large numbers of untrained personnel.

This Nation could ill afford to waste manpower sick abed—or buried—as a result of foodborne or other disease. The increased significance of the Public Health Service's responsibility to prevent the interstate spread of disease during the war emergency led to a major intensification of its railroad sanitation program. A large portion of the country at war was eating from the dining car's "hands," and these "hands" had to be kept clean.

As one of the first steps in discharging its increased responsibility, the Public Health Service in 1942 prepared the "Sanitation Manual for Land and Air Conveyances Operating in Interstate Traffic" (7) to provide public health and railroad workers with necessary information upon which to base their activities under the interstate quarantine regulations.

Mobile bacteriological laboratories of the Service toured the country. As part of their duties the laboratory staffs examined milk and water supplies used aboard dining cars and made swab tests of eating and drinking utensils to ascertain the adequacy of dishwashing and sanitizing methods aboard conveyances. Also, during this period, studies of the sanitation problems peculiar to dining car operation were being conducted by the Service.

After the war the railroads desired to reestablish, and even to improve, the traditional, pre-war, high-quality standards of their dining service. To aid them in their efforts, and to enhance its activities in the prevention of disease borne by food, milk, and water, the Service further expanded and intensified its dining car sanitation program. Additional personnel were employed and trained as inspectors, and liaison with railroad associations, individual companies, and designers and builders of dining cars was strengthened.

As a starting point in their program many railroads began planning the construction of new cars, and others undertook reconstruction



Courtesy Pullman-Standard Car Manufacturing Co.  
One of the first Pullman "hotel" cars—1867.

of old ones which had been so overworked during the war. It had long been recognized that the plant where a conveyance is built or rebuilt is one of the best health control points. Placing greater emphasis on construction, Service personnel began to furnish consultative and inspectional services to designers and builders of railroad passenger cars.

One large company, in 1914, requested advice in designing new equipment and rehabilitating old cars. Thus was born the Service's plan-review program, under which plans for construction or major repair of conveyances are examined and are either approved or returned to the carriers with recommendations for changes. Under provisions of the interstate quarantine regulations, carriers are required to submit such plans or to arrange for Public Health Service inspection during construction.

In 1951, with the cooperation of the Joint Committee on Railway Sanitation of the Association of American Railroads and railroad car-building firms, the Public Health Service published the "Handbook on Sanitation of Railroad Passenger Car Construction" (8), which contains guides for incorporating sanitary provisions into the design or construction of railroad passenger cars and the reconstruction of existing cars.

Nowadays, before accepting delivery of a conveyance, a carrier usually specifies that the builder must obtain a Certificate of Sanitary

Construction from the Public Health Service. This certification, which shows that dining cars have been constructed or reconstructed in compliance with the interstate quarantine regulations, is mutually advantageous to the carrier and the builder. The builder is protected from future criticism; the purchaser is assured that his conveyance has been constructed in accordance with high standards which reflect decades of sanitary engineering knowledge. Of 230 new and rebuilt railway conveyances completed in 1951, 1952, and 1953, Certificates of Sanitary Construction were awarded for 144, or 63 percent.

### Construction of Dining Cars

The typical modern dining car is about 85 feet long, seating 36 to 48 persons. Articulated twin units consist of 1 car, which seats from 64 to 68 persons, and an adjoining car, which contains the kitchen and either dormitory facilities, on an overnight run, or a lunch counter, if used in day service. Triple units have dining space in the cars at either end, with kitchen and dormitory facilities in the center car.

A multitude of limited facility cars are used either in combination with, or in lieu of, dining cars. These include coffeeshop, grill, lunch, cafe, buffet, counter, club, tap, bar, tavern, and lounge cars. Designs are usually as varied as the names, but they are not so different as their designations would suggest.

"Dining car," in Public Health Service sanitation terminology, means any railroad passenger conveyance on which food or drink is regularly prepared, stored, or served (9). Lounge and bar cars, snack cars, the recently introduced vending machine cars—and even the news butcher who peddles food and drink through coaches—all come under surveillance by Service inspectors.

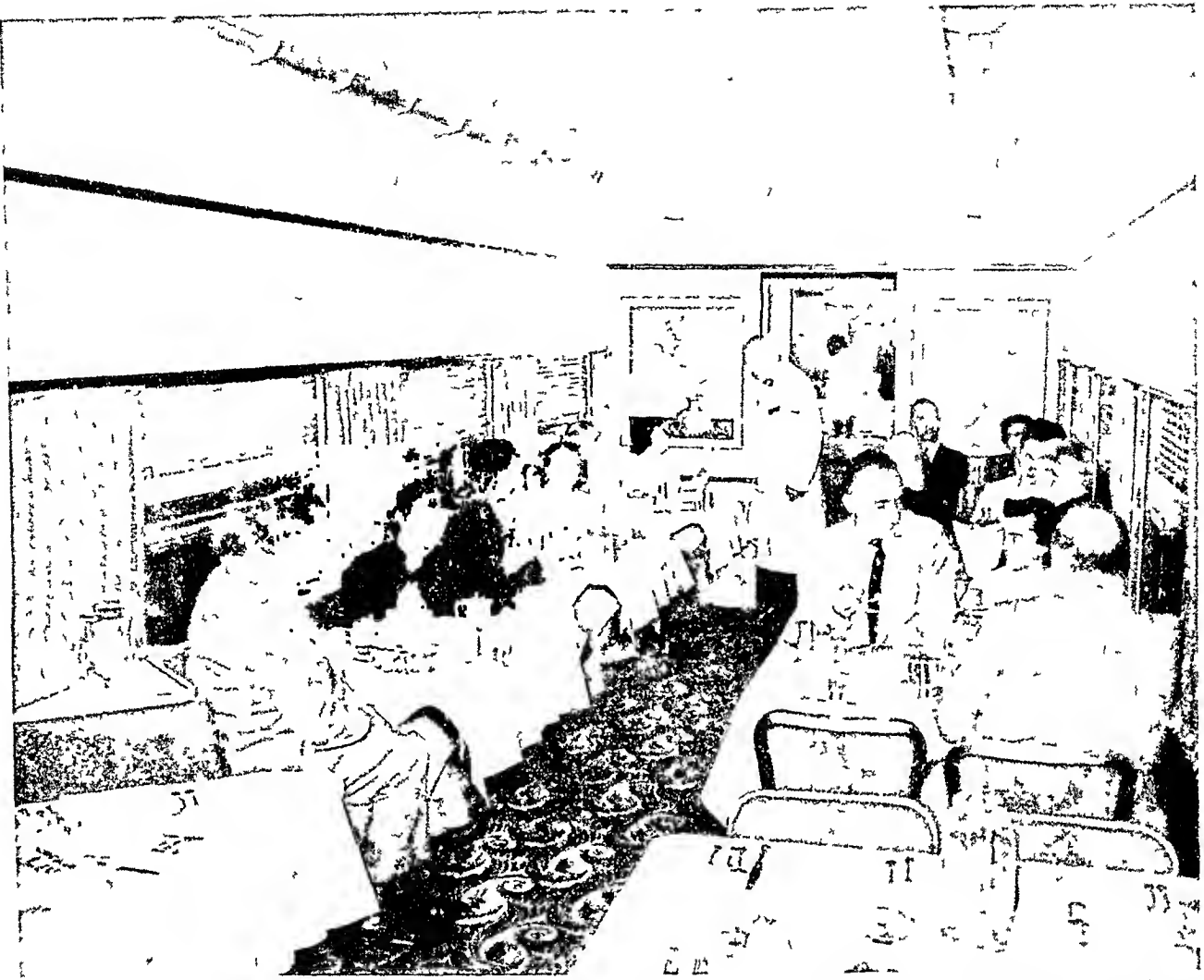
Probably the most obvious condition one notes on his first entry into a dining car kitchen is that space is extremely restricted. Since the kitchen and pantry are, usually, only about 30 feet long, practically every inch of available space is utilized in their construction. Operations must be conducted efficiently, and the old maxim, "a place for everything and everything in its place," must be observed punctiliously.

Perishables must be refrigerated, utensils must be washed and treated bactericidally, and all of the other facilities required for full-scale restaurant operations must be crowded into a little more than one-third of the area of a railroad passenger car. Consider, in addition, the proximity and heat of the ranges and the lurching and swaying of the train as it travels at high speed, and you may well be amazed that meals of such quality, and in such quantity, can be prepared and served.

The "conventional" dining car is equipped with a coal range, charcoal broiler, steam table, steam coffee urn, manual dishwashing facilities, and ice refrigerators. Special studies, liberally garnished with trial-and-error experiments, demonstrated that certain structural changes would result in better cleanability and sanitation in dining car kitchens, and would at the same time improve the comfort, convenience, safety, and operating efficiency of crew members. Thus, in the "improved conventional" diner, the modifications made, usually, have been in the fuel used for cooking and the refrigeration method. Also, mechanical dishwashing and more electrical equipment are often added.

Many roads turned to pressed sawdust logs, instead of coal, for cooking fuel, because the pressed logs were more easily stored and their use resulted in a somewhat cooler and cleaner kitchen and eliminated the noxious coal gases. Other lines converted their ranges to burn oil, or butane or propane gas (10). These fuel improvements gave the employees a much cleaner and cooler kitchen and also faster and more uniform heat. There was, moreover, a saving of precious space, which is at a premium in any dining car kitchen. Certain roads by installing electric ranges further improved these factors.

Refrigeration came in for its share of modification. For many years railroads had used ice exclusively. But ice had some serious disadvantages as a refrigerant for dining car purposes. Its bulky form took up much valuable refrigerator space. More important, from the public health viewpoint, the uneven, relatively high, and uncontrollable temperatures often resulted in deterioration of foodstuffs and made possible the growth of any pathogenic bacteria which might have been present.



Courtesy Baltimore and Ohio Railroad, Inc

### Dinner in the modern diner.

Some railroads have found that dry ice (carbon dioxide) refrigeration overcomes the shortcomings of ice made from water (11). Since dry ice is more compact, it conserves space needed for the storage of perishable foods. Dry ice refrigeration units may be equipped with thermostatic controls which permit, to some extent, the stocking of frozen foods. Moreover, dry ice lasts six times as long as water ice. Icing is done inside the car, thus eliminating the need for overhead ice bunkers through which dust often entered.

Several carriers have installed mechanical refrigeration. Elimination of ice storage compartments of any kind increases refrigerator capacities by as much as 30 to 40 percent. The low temperatures which can be achieved and

their high degree of uniformity enable the wide use of frozen food products.

Blueprints for an "all electric" diner were drawn in 1936, but the first such car was not actually built until 1949 (12). Two-story dining cars are now under construction. Even three-level diners are within the realm of speculation. As railroads seek new methods of improving their dining service, the future appears to point to the electronic diner which is, in fact, already in limited use (13). The most important use of electronics will be, probably, in the realm of microwave cooking, or what may be more accurately described as "food conditioning." Experimentation with this method (14), conducted by railroads in the past few years, has demonstrated that the system has

several important advantages over current methods. It will solve many of the existing sanitation problems, but it will, undoubtedly, intensify or create others.

Although dust control is a problem, to a certain degree, in practically any food establishment, the problem is much greater on dining cars. Special precautions must be taken since roadbed dust which might carry pathogenic bacteria is easily sucked into these mobile restaurants as the trains speed along. Caps must be provided over floor and refrigerator drains, or water-sealed traps must be built into drain-lines, to prevent the infiltration of dust. Windows and doors must be sealed or tightfitting. The practice of opening the kitchen loading door to increase air circulation long ago was recognized by the Service as a potential hazard.

Adequate ventilation of dining car kitchens has long been of concern to railroad officials, operating crews, passenger car builders, and the Public Health Service. Early attempts to reduce radiant heat, improve ventilation, and enhance crew comfort included the application of grills with filters to the side doors and the increased use of exhaust fans. Smoke pipes, oven doors, and the fronts of combustion chambers were insulated, and movable insulated shields were installed in front of the stoves for the protection of the cooks.

Each of these measures improved conditions to some degree, but dining car kitchens continued to be far from ideal work areas. Until recently, despite the modernization of passenger accommodations beginning around 1930, little attention had been given to the air conditioning and ventilation of kitchens and pantries. The design engineer was confronted with many developmental problems, and it was not until 1946 that the first forced-air ventilation system for a dining car kitchen was built. Numerous improvements have been made since then, but other problems remain to be solved.

At least one railroad (and there are indications that others might follow) has adopted a new type of diner with open kitchen and pantry, permitting its crew to prepare short-order meals in the air-conditioned atmosphere enjoyed by passengers. An added advantage is that, since the crew works in their constant view, the passengers become their own public health in-

spectors. This tends to influence the crew to maintain a high degree of cleanliness.

Other notable improvements in the sanitary construction of dining cars in recent years include:

- Increased use of noncorrodible, nonporous, and easily cleanable materials, such as stainless steel.

- Rounding of joints, filling and finishing of construction seams, and enclosing of inaccessible spaces, to promote cleanability and to eliminate harborage for vermin.

- Installation of adequate and convenient hand-washing facilities.

- Provision of proper facilities for washing and bactericidal treatment of utensils, whether done by manual or mechanical means.

- Improved methods of storing or disposing of garbage.

- Increased lighting on working surfaces and in lockers and refrigerators.

- Provision of suitable facilities for the storage and washing of ice for use in beverage glasses.

- Installation of wells with hot or running water for storage of frozen dessert dispensers.

- Construction of shelves, can openers, tray and knife racks, and other equipment so they can be easily removed and cleaned.

- Also, increased use of dormitory cars with sleeping, ablutionary, toilet, and clothing storage facilities has encouraged personal hygiene of crew members and contributed materially to sanitation of dining cars. Some railroads bought new equipment for this purpose. Others converted old coaches, lounge cars, or other equipment into employees' quarters.

#### **Public Health Service Inspections**

The Association of American Railroad Dining Car Officers and the Association of American Railroads' Joint Committee on Railway Sanitation assisted in the preparation of a manual, the "Handbook on Sanitation of Dining Cars in Operation" (2), published in 1952, which was designed to assist those who must apply the principles of food sanitation in routine dining car operation and maintenance.

The official dining car inspection report is based on the sanitation standards given in the

published handbooks. Weights have been assigned the various items of sanitation on the form so that dining cars can be rated numerically. This affords a means of comparison, both among cars of one railroad and among the diners of different carriers. It is, also, a means of measuring and evaluating advancement in the dining car sanitation program.

More than 2,000 dining car inspections are conducted annually. Continuous improvement in sanitation of dining cars in operation is indicated by the gradual rise of the national average sanitation rating of all conveyances inspected. The average rating rose from 86.7 in 1951 to 89.0 in 1953. A Certificate of Sanitation is awarded to a carrier for each dining car which rates 95 or higher on inspection. The certificate is posted aboard the conveyance where it can be easily seen by passengers and employees, thereby stimulating interest in sanitation and promoting competition among crews. Certificates of Sanitation were issued for only 17.3 percent of the dining car inspections in 1951. The percentage increased to 24.1 in 1953. Also, in that year, the Service awarded a special citation to the first major railroad whose dining cars had all rated Certificates of Sanitation (15, 16).

The "good ol' days" custom of obtaining meals at station stops has been continued on certain runs; it is being revived or initiated on others. Sanitation of these establishments comes under local control since they cater also to the non-traveling public.

Supplying dining cars, particularly with perishables, is a serious consideration. Commissaries with adequate storage and handling facilities and competent personnel must be established along the line to restock the cars on long runs. Since these establishments, of which there are about 200, do not serve the local public, they are usually inspected only by the Service.

The use on trains of vending machines which dispense sandwiches, ice cream, cake, crackers, doughnuts, fruit, candy, coffee, milk, juices, and soft drinks has increased in the past few years. There are indications that this trend may continue. The machines, usually installed in a coach, may supplement or supplant dining car service. Preparation, storage, and handling of

foods at supply sources, replenishment of stocks aboard cars, and cleaning and servicing of machines—all are scrutinized by Service inspectors. In addition, close liaison is maintained with equipment designers and fabricators to assure, for example, that refrigeration is adequate, that the machines are easily cleanable, that food contact surfaces are of nontoxic materials, and that vermin harborages are not afforded within the units.

Much has been done to ascertain and inspect sources of prepared sandwiches sold by the



Courtesy ACF Industries, Inc.

#### **Kitchen and pantry of a modern dining car.**

news butcher. In the past, disease outbreaks which have been attributed to such foods were traced to questionable sources of supply. Personal hygiene of employees has not always been up to desirable standards. Refrigeration has often been inadequate, and storage and disposal of garbage and other refuse have frequently been unsatisfactory. To overcome these hazards, many railroads do their own vending from the dining cars, by sending crew members through the train with food and drink. In any case, concessionaires are held to the same rigid standards of food sanitation as the dining car department, and they are subject to the same strict and frequent inspections.



To assure compliance with those provisions of the interstate quarantine regulations pertaining to the serving of wholesome foods, the safety of water, the purchase of shellfish from approved dealers, and the pasteurization of milk and frozen desserts, the dining car sanitation program extends beyond the railroad's facilities to the very sources of supply. Long-established arrangements have been continued with State health departments for routine supervision of suppliers. Each year about 3,000 inspections are made of sources of water, milk, and frozen desserts.

To keep carriers informed of the status of each supplier, the Service publishes the "Official Classification of Railroad Watering Points" and the "Official Classification of Milk and Frozen Dessert Sources." These are semi-annual listings of sources of supply which have been inspected and classified as approved, provisionally approved, or prohibited for the use of interstate carriers. Provisionally approved sources must effect the necessary corrective action without delay or they risk being classified as prohibited sources. Lists of shellfish dealers who hold unexpired and unrevoked certificates issued by State authorities also are published regularly by the Service.

### **Disease Outbreaks**

If a disease outbreak occurs on a train, or is suspected of resulting from food or drink consumed or environmental conditions encountered on a conveyance, the Public Health Service and State and local health departments have technicians who cooperate in epidemiological surveys to determine the cause of the outbreak and to prevent recurrence. Fortunately—no doubt as a result of the far-reaching preventive measures—railroads find it necessary to avail themselves of this service very infrequently.

Data on disease outbreaks resulting from food or drink consumed on dining cars are indeed meager. This is easily understandable. It is well known to public health workers that complete and accurate reporting of all disease outbreaks is virtually impossible. This is particularly true of most food-poisoning illnesses which, though often violent, are of comparatively short duration. Many victims do not seek

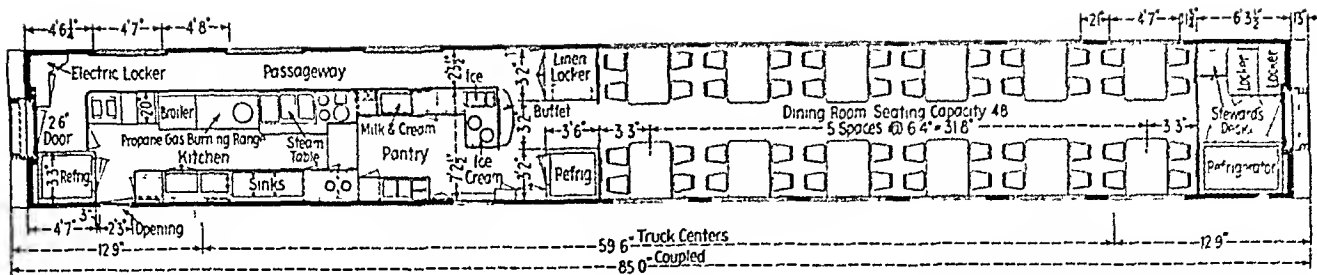
medical assistance, and recovery is usually rapid and complete. Because railroad passengers scatter to various parts of the country upon completion of their journeys, epidemiological investigations are complicated. Generally, cases are reported to public health officials only when the outbreak occurs en route, when many affected passengers debark at a common terminal, or when groups of afflicted passengers travel together in special parties.

During the 1942-45 wartime period, 10 disease outbreaks involving 668 persons, of whom 434 were military personnel, were traced to food or drink consumed on railroad trains. In the next 8 years (1946-53), as the dining car sanitation program gained momentum, 5 outbreaks with 75 cases were reported. Two of these, totaling 40 cases, occurred during one extensive special movement in which railroads were taxed to the limit, requiring the use of much standby equipment and the employment of many extra personnel. Notwithstanding the acknowledged shortcomings of morbidity reporting peculiar to outbreaks among railway passengers, available statistics appear to substantiate the effectiveness of the Service's dining car program.

### **Training for Employees**

Through routine inspections of dining cars in operation, the Public Health Service found that structural improvements alone would not raise sanitation to the desirable level. To reduce the possibility of foodborne illness, employees needed to have a thorough understanding of the principles and reasons for food service sanitation, proper use of equipment, and approved methods of conducting operations. Railroad officials agreed with this conclusion, and intensive training programs became the order of the day, beginning in the 1940's.

Some of these training courses are conducted by the carriers themselves. Some are conducted exclusively by the Public Health Service. But, generally, dining car departments and the Service collaborate closely. Sometimes a dining car is turned into a classroom, and courses are held in commissaries, union halls, or other available meeting rooms. Teaching methods vary, but the emphasis is on informal discussions.



Courtesy of Car Builders' Cyclopedia.

**Floor plan of a typical dining car.**

Occasionally, carriers make attendance mandatory at training courses; but, for most, it is voluntary. In either case, there usually is little discernible difference in the turnout or level of interest. Crew members seem glad to have the opportunity to discuss their problems and to learn approved methods and standards of food sanitation. Many, of their own volition, attend subsequent training sessions. The Public Health Service issues a wallet-sized Certificate of Attendance to each employee completing the course.

Some carriers have requested refresher courses at 6-month intervals. Dining car employees' organizations have become enthusiastic about the promotion and expansion of such refresher training. Significant improvement in operation of diners has been noted on many carriers, and there have been definite indications that the training sessions have impressed the crews with the importance of the principles of sanitation and hygiene.

One dining car superintendent, whose company in 1 year spent \$8,000 on training courses, remarked, "The improvement in operations accruing from food service employees' training programs is in itself sufficiently substantial a return for the investment made."

Most railroads, in an effort to improve and maintain sanitary conditions on their diners, engage traveling inspectors or inspection teams who board cars in service, observe operations, call attention to defects in equipment and methods, and give instruction in proper food service. A recent innovation has been the training by the Service, of inspectors of certain companies to follow the official Public Health Service inspection procedure. Ratings obtained by these inspectors are not considered official for the purpose of issuing Certificates of Sanitation,

or for computing the annual average rating of their cars. However, this system has proved to be a valuable adjunct to the Service program and has significantly raised the level of sanitation on diners.

Education of employees is a never ending phase of the dining car sanitation program. Personnel of the Service's regional offices give instruction in food service sanitation, interpret regulations for carriers as an aid in the formulation of company rules governing dining car employees, and assist carriers in developing visual aids and other education materials.

In 1953, the Public Health Service produced its first film devoted specifically to the subject of dining car sanitation. This visual aid, actually a filmstrip, is entitled "Food Sanitation in Dining Cars." It was produced with the cooperation of the Association of American Railroad Dining Car Officers and is available to carrier companies or employee organizations.

Many carriers now have company publications devoted exclusively or in part to dining car service. These usually include items on particular phases of sanitation, to serve as constant reminders to crew members that sanitation is a never ending and exceedingly important part of their service.

The advancement in dining car sanitation is all the more remarkable when one considers that no railroad has ever, with the exception of the war years, realized a profit from the operation of dining cars (5). Still, development and improvement of dining service are proceeding persistently, and railroads are justifiably proud of their equipment, food, and service.

While the Public Health Service program of dining car sanitation has its legal basis in the Interstate Quarantine Regulations, it has been conducted, historically, on a cooperative and



educational basis with the carriers. The Service is primarily interested, not in arbitrary exercise of its powers, but in a high level of sanitation on dining cars. Because virtually all carriers are intent on the same objective, the program has traditionally had their wholehearted support.

#### REFERENCES

- (1) Tetzlaff, F., Butrico, F. A., and Resnick, P.: Sanitation on interstate carriers. Health News (New York State Department of Health) 31: 4-18, March 1954.
- (2) 27 U. S. Stat. 449.
- (3) Interstate Quarantine Regulations, 42 Code of Federal Regulations 72; also 42 CFR 53 Supp. 72.
- (4) Mendelsohn, I. W.: Modern railway sanitation. Municipal Sanitation 2: 322-326, July 1931; 391-393, Aug. 1931; 436-440, Sept. 1931.
- (5) Paden, D. L.: Problems and economics of railroad dining car service. Master's thesis. Bloomington, Ind., Indiana University School of Business, 1952.
- (6) Waters, L. L.: Steel trails to Santa Fe. Lawrence, Kans., University of Kansas Press, 1950, ch. 8.
- (7) Sanitation manual for land and air conveyances operating in interstate traffic [adopted and promulgated by the U. S. Public Health Service, October 2, 1942]. Pub. Health Rep. 58: 157-193, Jan. 29, 1943. Reprint No. 2444.
- (8) U. S. Public Health Service: Handbook on sanitation of railroad passenger car construction. Standards of sanitation applicable to the construction of railroad passenger and dining cars. Public Health Service Pub. No. 95. Washington, D. C., U. S. Government Printing Office, 1951.
- (9) U. S. Public Health Service: Handbook on sanitation of dining cars in operation. Standards of sanitation for operation and maintenance of food and drink service on railroad passenger cars. Public Health Service Pub. No. 83. Washington, D. C., U. S. Government Printing Office, 1951.
- (10) Diners and grill cars for the "Eagles." Railway Age 125: 52-57, Sept. 18, 1948.
- (11) New dining cars for the Union Pacific. Railway Age 126: 37, April 2, 1949.
- (12) Illinois Central all-electric diner. Railway Age 126: 87-89, Mar. 12, 1949.
- (13) What electronics may do on diners. Railway Age 122: 784-791, Apr. 19, 1947.
- (14) Pennsylvania experiments with radar cooking. Railway Age 126: 48, May 28, 1949.
- (15) Award to Erie for modernized dining service. Single Service News (Paper Cup and Container Institute, Inc., New York), Aug.-Sept. 1953, pp. 2-3.
- (16) Dining car sanitation award. Pub. Health Rep. 68: 810, August 1953.

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# Results of the Cancer Teaching Program In Dental Schools

By RAYMOND F. KAISER, M.D.

A PROGRAM of grants to dental schools for the integration and improvement of cancer teaching was inaugurated in 1948 as a step toward the control of intraoral neoplastic disease through earlier diagnosis and treatment. The program has been expanded steadily until, at the present time, the National Cancer Institute is administering Public Health Service grants to 43 dental schools throughout the country. The results have been gratifying, especially in that the new generations of practicing dentists are aware of the important part they can play in the early detection of cancer in their patients.

It was the opinion of the staff and advisers of the National Cancer Institute in 1947 that the dental profession could take an important part in cancer control. This feeling was based on a number of factors. Among them was the knowledge that the most effective way to discover cancer in an early stage is through careful periodic examinations. Because the dental profession, through its public education program, has been successful in motivating people to visit their dentists regularly, the dentist has an unequalled opportunity for periodic inspection of the oral cavity among his patients under the most desirable conditions. Therefore,

the dentist, if properly informed and trained, is in a position to discover many early cases of cancer.

In addition, experience has shown that an appreciably large number of patients with intraoral cancer, particularly cancer of the gingivae, consult their dentist prior to seeking advice from their physician, thereby providing the dentist with the initial opportunity to discover and observe early cancer. Coupled with this is another advantage possessed by a member of the dental profession. That is the opportunity to follow up the patient whom he has advised to seek further medical attention. This followup can be accomplished by the simple procedure of scheduling a dental appointment subsequent to the date the patient was referred for medical attention.

Often the dentist can aid cancer control by searching for and correcting oral conditions which may contribute to the causation of cancer. Finally, the dentist can contribute to the welfare of the cancer patient through proper dental care and preparation of necessary appliances and prostheses.

In 1947, at a joint meeting of the National Cancer Institute and the Council on Dental Education of the American Dental Association, it was agreed that the dental profession in general would be aided if a program were initiated to orient the profession to the specific dental aspects of the cancer problem. It was agreed that this orientation could best be accomplished by an approach to the oncoming generation of dentists through integration and improvement of

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oral cancer instruction in the dental schools. With the approval of the National Advisory Cancer Council, the institute undertook a program of grants under which approved dental schools were eligible to receive up to \$5,000 annually.

The history of participation of the 43 schools cooperating in the program has been as follows:

<i>Schools</i>	<i>Year of participation</i>
17-----	7th
16-----	6th
4-----	5th
2-----	4th
2-----	2d
1-----	1st

NOTE: 1 school participated for 2 years but was unable to continue because of personnel problems.

Upon the initiation of the program in each school, a member of the faculty was designated to serve as cancer coordinator. At present the coordinators are distributed in the following disciplines:

Oral pathology-----	11	Histology-----	1
Oral surgery-----	6	Associate dean-----	1
General pathology---	7	Associate professor of	
Oral medicine-----	4	dentistry-----	1
Deans-----	4	Oral diagnostician---	1
Dental medicine----	2	Dental prosthesis---	1
Clinical pathology--	1	Periodontology-----	1

This current distribution reflects a turnover of approximately 25 percent of the coordinators since the inception of the cancer teaching program, although, by and large, the group has remained relatively stable. In the majority of the schools, the coordinator has the benefit of the advice and assistance of a cancer teaching committee, appointed during the initial period of the grants program.

### Areas of Deficiency

At the outset of the program these individuals and committees reviewed the teaching of cancer within their own schools and, with the exception of a very few schools, uncovered the following findings in relation to such instruction:

A general belief prevailed within and outside the schools that dentistry was essentially a restorative art and that knowledge of cancer was not pertinent to dental practice.

The teaching of oral cancer was unorganized, uncoordinated, nonsystematic, and casual.

There was not time in the dental curriculum for courses other than those concerned with restorative dentistry.

A scarcity of suitable teaching material existed among patients admitted primarily for dental treatment.

Little or no histopathological cancer material was available.

Practically no student slide collections of cancer were available.

Very little opportunity existed for students to observe cases of clinical cancer either on a demonstration basis or through clinic or hospital experience.

Teaching materials and equipment were inadequate to provide instruction on the cancer problem.

Experienced personnel qualified to provide cancer instruction were insufficient.

There was generally inadequate correlation between preclinical and clinical teaching.

These represent, in general, the major areas of deficiency encountered by representatives of the schools, although others of varying degree and type existed in some schools.

### Allocation of Funds

It was recognized on initiating the cancer teaching program that the most effective methods of improving cancer instruction would vary from school to school, and it was decided that each school should have the opportunity to develop the type of program which best met its particular circumstances.

An analysis of the funds requested by the dental schools gives some indication of the uses to which the schools put the grants. In the first year of operation the total grants for all participating schools were distributed in this manner: 57 percent for personnel, 19.1 percent for permanent equipment, 13 percent for consumable supplies, 5.9 percent for travel, 2.4 percent for other expense, and 2.6 percent for overhead. In 1954 the funds requested were distributed in the following manner: 75.7 percent for personnel, 8.0 percent for permanent equipment, 5.9 percent for consumable supplies, 4.5 percent for travel, 0.4 percent for other ex-

pense, and 5.5 percent for overhead. During the course of the program there has been a general tendency to increase the percentage for personnel and overhead and to decrease the percentage in the other categories—consumable supplies, permanent equipment, travel, and other expense.

### More Time and Materials

The schools have shown many similarities in their efforts to improve cancer teaching. All of the schools in one way or another have been able to rearrange their curriculums to add a sizable number of clock hours of cancer instruction in both didactic lectures and laboratory exercises. Additional emphasis has been placed on cancer in oral pathology by 36 schools, general pathology by 27, oral diagnosis by 24, oral surgery by 23, oral medicine by 4, dental medicine by 2, prosthetics by 1, and periodontia by 1. In addition, new courses of various types specifically concerned with oral cancer have been added to the curriculum by 25 schools.

Since effective teaching in oral cancer, as in any type of cancer instruction, is directly related to the quantity and quality of clinical material available for presentation, 24 schools have supplemented their clinical teaching by arranging for their students to participate in tumor clinic activities through association or affiliation with teaching hospitals. Two additional schools have organized their own clinics or oral diagnostic centers; 11 additional schools present patients to students through demonstration clinics; and 2 schools accomplish this by means of ward walks. Sixteen schools conduct tumor conferences as a part of their teaching programs. Thus, an increasing number of dental students have an opportunity to observe patients with cancer in all stages of the disease and to become familiar with differential diagnosis along with the various methods of therapy.

To increase histopathology material for student instruction, 26 schools have established a biopsy diagnostic service for dental practitioners. In most instances this tissue service was established by the expansion of existing facilities through the purchase of equipment and the acquisition of technicians under the grants,

but in 9 schools grant funds were used to initiate and establish new tissue laboratories. In all 26 schools student work with tissue slides has been markedly increased, and for the first time adequate individual student slide collections have been made available. Four schools require students to attend autopsy examinations of cancer patients. In the schools providing this biopsy service there has been a marked, steady increase in the number of biopsy specimens received. Without exception the schools consider this increase one measure of the success of their cancer teaching program since recent graduates are contributing the greater share of the biopsy specimens. Twenty-four schools demonstrate how to take a biopsy, while in 16 schools the student is required to take one or more biopsies and follow through the processing of the specimen to the histological slide.

The grant program has made it possible for all participating dental schools to strengthen their visual education and teaching materials. These vary from school to school but include color photographs of cancer lesions, lantern slides, histopathological slides, photomicrographs, exhibits, specimen displays, mouldages, models, films, and filmstrips as well as equipment such as cameras, projectors, screens, slide viewers, microscopes, and scopicons. Four schools have prepared short films on biopsy techniques for the instruction of students as well as practitioners.

### Enlarged Staffs

Further evidence that the schools' interest in cancer teaching has increased in spite of the limited amount of the grants is the fact that 13 professional persons and 21 nonprofessional laboratory technicians, photographers, and a laboratory secretary have been added to the staffs of the schools as a direct result of these grants. In addition, numerous staff members have contributed time and effort toward the teaching program without any monetary recompense from the grants. In the field of personnel, two schools have used some of their funds for teacher training.

The grants have stimulated nine schools to undertake cancer and other research activities, and they have established programs which pro-

vide students the opportunities for investigative work.

Special lectures and seminars have been used by 24 schools as a method to increase cancer instruction. As in many teaching programs, and this one is no exception, the cancer teaching spills over from the undergraduate area into the postgraduate. Students, as well as practitioners, participate in the lectures and seminars mentioned above. Ten schools have established specific programs of postgraduate education. One of these has initiated a case history service for practitioners, and the remainder offer refresher courses and special or postgraduate courses for practitioners and graduate students.

This summation of specific accomplishments as a result of the stimulation of cancer teaching grants is based on special reports from the individual schools expressing objectively the actual results attributable to the grants and a personal knowledge of the programs in a number of the schools gained through field visits by the staff of the National Cancer Institute. Many of the coordinators have expressed the belief that a cancer learning test developed for dental schools is valuable for measuring the improvement of cancer teaching within their institutions. Twelve schools have reported a steady improvement in the scores of their students during the years they have participated in the testing program.

### Summary

A number of years have gone by since the initiation of the cancer teaching program, and

it is now possible to take a long-range view of its effect and to enumerate a number of general accomplishments:

- It has made possible the expansion of oral cancer instruction and increased the curriculum time devoted to cancer teaching.

- It has increased clinical material for dental students.

- It has increased student participation in clinical cancer activities.

- It has promoted the development and utilization of teaching materials, facilities, and equipment.

- It has helped correct the traditional view that knowledge of cancer was not pertinent to dentistry and helped to clarify the role of the dentist in control of the disease.

- It has strengthened cooperative relationships between the medical and dental professions.

- It has increased the dental students' awareness of cancer and has impressed on him his responsibility for the early recognition of cancer.

- It has developed teaching personnel within dental staffs.

- It has augmented and enhanced the quality of oral cancer instruction.

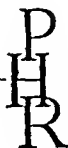
- It has increased cancer facilities and services.

- It has stimulated the establishment of diagnostic biopsy services.

- It has stimulated and expanded research interests of dental school facilities.

- It has pointed up the need for cancer instruction in postgraduate fields.

- Lastly, it has accomplished a general improvement in the teaching of oral cancer.



*In a New York State Health Department study, a comparison of original death certificates and certificates prepared from autopsy protocols revealed an appreciable degree of inaccuracy in cause-of-death statements.*

## Accuracy of Cause-of-Death Statements On Death Certificates

By GEORGE JAMES, M.D., M.P.H., ROBERT E. PATTON, M.P.H.,  
and A. SANDRA HESLIN, M.S.

THE BASIC DATA on which public health activities have been planned have come primarily from vital statistics. Birth and death certificates have provided information essential to the operation of nearly all health programs. Since the start of the vital registration systems in this country, the emphasis has been on completeness of reporting. The entrance of a State into the birth or death registration area was determined primarily by its achieving a stated percentage of completeness of reporting, and no other criterion for accuracy in vital statistics has yet been generally employed.

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Questions have been raised, however, as to the accuracy of the information on these certificates, and some attempts have been made to assess the accuracy of various items. Swartout and Webster (1) reviewed earlier studies of the accuracy of cause-of-death statements and compared autopsy diagnoses for 8,080 persons in Los Angeles Hospital with the cause of death which they believed would have been listed had no autopsy been performed. They found 79 percent agreement between the diagnoses, with the percentage by categories varying from 100 percent for measles, scarlet fever, and cancer of the mouth to 16 percent for softening of the brain. When they used broader categories for their comparisons, the agreement reached 90 percent. Agreement was only 50 percent for those patients who were admitted to the hospital within 48 hours of death. All diagnoses were made by the authors themselves, using the fifth revision of the International List of Causes of Death, and multiple causes were resolved through the Manual of Joint Causes. They did not study the actual certificates filed by the attending physician.

In 1949, Dr. A. G. Evans, in an unpublished study, analyzed a sample of 3,900 from a total

of 161,600 death certificates for the years 1946 and 1947. Based upon his own judgment as to what constituted a satisfactory statement of the cause of death and without any consideration of autopsy data, he discovered that 57 percent were defective. Of this defective group, almost half had incomplete medical certification, 24 percent used obsolete or unacceptable terms, and 28 percent represented inaccurate medical certification. He suggested greater emphasis on querying of death certificates by health officers. On the average, only about 3 percent of death certificates in the Nation as a whole are queried, and, according to a recent survey, only 8 State and Territorial health departments estimate that they are querying more than 5 percent of death certificates submitted (2).

Pohlen and Emerson (3) obtained cause-of-death data based on both ante-mortem and post-mortem findings from 15 cooperating hospitals in New Jersey and New York State. Deaths from cancer were analyzed in an attempt to determine the accuracy of the diagnosis and of the determination of the anatomical site of the cancer when based on clinical data alone. Of 3,462 deaths found at autopsy to have been due to cancer of various sites, the diagnosis for 77 percent was etiologically correct; for 77 percent it was topologically correct; and for 67 percent it was correct in both ways. Cancers of certain sites, such as the breast, the pharynx, and the rectum, were correctly diagnosed ante mortem relatively more often than were those of sites such as the brain, the liver, and the bile ducts. In addition, the autopsy data revealed that 148 deaths attributed to cancer on the clinical diagnosis were actually due to some other cause.

Korns and Lintz (4) concluded from a review of 500 autopsy protocols from 5 hospitals that there was an 11 to 20 percent disagreement between the medical statements appearing on death certificates and the pathological findings at autopsy. They used the fifth revision of the International List of Causes of Death and the Manual of Joint Causes.

The present study was made to determine how closely the reporting of the cause of death under the current system tallies with the best possible estimation of the facts. The initial

problem was to determine what could be used as a standard for comparison; in other words what was the "true" underlying cause of death? In general, a diagnosis made on the basis of a complete, competently performed autopsy and a good clinical history is as close to the truth as modern medical science can come. This procedure, of course, does not completely solve the problem, because the pathologist does not and cannot always state the underlying cause of death singly and unequivocally. Multiple factors may be present, any one of which could cause death or whose effect may lie only in their particular combination. The present vital statistics system, however, is geared in such a way that each death must be attributed to one and only one cause. Needed to measure the accuracy of this system, therefore, is a theoretically true underlying cause of death, defined as that cause of death which a well-trained physician would enter on the death certificate after he had obtained all possible information, including a clinical history and findings of a complete autopsy. In this study, such a theoretically true cause of death was determined for a large number of deaths occurring in upstate New York and compared with the cause entered on the original death certificate. Data obtained were then used to evaluate the accuracy of the cause-of-death statements on the original certificates.

### Study Method

The records of all autopsied deaths occurring in 12 hospitals in the Albany, N. Y., region in 1951 and 1952 were examined by a team of three third-year medical students working under the junior public health intern program of the New York State Department of Health. These students had received special training in how to complete a medical certification section of a death certificate, and their abilities in this regard were tested carefully by the authors. Each autopsy protocol, including the clinical summary, was reviewed, and if the autopsy was complete, a standard death certificate was filled out, the pathologist's results being used in completing the cause-of-death statement. A total of 1,889 such certificates were completed and analyzed. All of the pathology services in

the cooperating hospitals were under the direction of a physician qualified under New York State's public health law, which requires qualifications equal to those required by the American Board of Pathology.

These certificates, called autopsy certificates in this report, were then coded by the regular coding staff of the New York State Department of Health according to the sixth revision of the International Lists of Diseases and Causes of Death in the same manner as are all death certificates. The regularly filed death certificate, called original certificate, was then examined for each of these cases, and the originally coded cause of death was entered on the completed autopsy certificate. The data were grouped according to 30 broad categories of cause of death similar to those used by the New York State Department of Health in its published vital statistics reports.

In developing the method used in this study, two questions had to be answered by small methodological studies:

1. Could the three reviewers, working independently, draw the same conclusions as to the underlying cause of death from identical autopsy data?

To answer this question, each of the three reviewers prepared autopsy death certificates from a series of 50 consecutive autopsy protocols from the files of a teaching hospital. For 46 of the 50 cases (92 percent), there was complete agreement within New York State's vital statistics groupings; for 2 cases (4 percent) 2 of the three reviewers were in agreement; for the remaining 2 (4 percent) each reviewer listed a different cause of death. Of the 46 autopsy certificates on which all 3 agreed, there was disagreement with the original certificate on 6 (13 percent). When each reviewer was tested

Table 1. Number of deaths by cause according to original death certificate and autopsy certificate

Cause of death <sup>1</sup>	Number according to original certificate	Number according to autopsy certificate	Percent change when autopsy data were used
Total	1, 889	1, 889	
Tuberculosis (001-019)	48	56	16.7
Syphilis (020-029)	12	5	-58.3
Other infective and parasitic diseases (040-138)	28	28	0
Malignant neoplasms (140-205)	402	409	1.7
Other neoplasms (210-239)	15	14	-6.7
Diabetes mellitus (260)	36	16	-55.6
Vascular lesions affecting central nervous system (330-334)	131	119	-9.2
Various diseases of sense organs (340-399)	21	25	19.0
Rheumatic fever (400-402)	5	4	-20.0
Chronic rheumatic heart disease (410-416)	41	50	22.0
Arteriosclerotic heart disease (420)	276	267	-3.3
Chronic endocarditis (421, 422)	23	20	-13.0
Other diseases of heart (430-434)	10	6	-40.0
Hypertension with heart disease (440-443)	41	19	-51.2
Hypertension (444-447)	29	41	41.4
General arteriosclerosis (450)	17	36	111.7
Other diseases of arteries (451-456)	18	24	33.3
Other diseases of circulatory system (460-468)	8	4	-50.0
Chronic and unspecified nephritis (592-594)	23	26	13.0
Acute nephritis and nephrosis (590, 591)	6	9	50.0
Pneumonia, except pneumonia of newborn (490-493)	57	57	0
Other respiratory diseases (470-527, excluding 490-493)	33	33	0
Diseases of digestive system (530-587)	171	181	5.8
Hyperplasia of prostate (610)	12	16	33.3
Congenital malformations (750-759)	62	71	14.5
Certain diseases of early infancy (760-776)	121	111	-8.3
Senility and ill-defined causes (780-795)	6	5	-16.7
Accidents, poisonings, and violence (E800-E962)	156	165	5.8
Suicide, homicide, etc. (E963-E999)	14	12	-14.3
All others (241-252, 261-289, 290-299, 300-326, 600-609, 611-749)	67	60	-10.4

<sup>1</sup> Numbers in parentheses are category numbers of the sixth revision of the International Lists of Diseases and Causes of Death.



Table 2. Distribution of deaths according to cause given on original

Cause of death according to original certificate <sup>1</sup>	Cause of death, by International List									
	Total	001-019	020-029	040-138	140-205	210-239	260	330-334	340-399	400-402
Total.....	1,889	56	5	28	409	14	16	119	25	4
Tuberculosis (001-019).....	48	45			1					
Syphilis (020-029).....	12		3					2		
Other infective and parasitic diseases (040-138).....	28	1		16	1				5	
Malignant neoplasms (140-205).....	402			1	372	5		5		
Other neoplasms (210-239).....	15				3	5		3		
Diabetes mellitus (260).....	36						11	2		
Vascular lesions affecting central nervous system (330-334).....	131	3		1	4			78	2	
Various diseases of sense organs (340-399).....	21	1		1	1			1	12	
Rheumatic fever (400-402).....	5									
Chronic rheumatic heart disease (410-416).....	41	1								2
Arteriosclerotic heart disease (420).....	276	3			10		1	5		
Chronic endocarditis (421, 422).....	23				1		1	4		
Other diseases of heart (430-434).....	10									
Hypertension with heart disease (440-443).....	41		1				1	4		
Hypertension (444-447).....	29	2			1			2		
General arteriosclerosis (450).....	17				1			2		
Other diseases of arteries (451-456).....	18		1					3		
Other diseases of circulatory system (460-468).....	8				1			1		
Chronic and unspecified nephritis (592-594).....	23							2		2
Acute nephritis and nephrosis (590, 591).....	6									
Pneumonia, except pneumonia of newborn (490-493).....	57			2	3		1	2	1	
Other respiratory diseases (470-527, excluding 490-493).....	33			2	1			1		
Diseases of digestive system (530-587).....	171			1	7	1				
Hyperplasia of prostate (610).....	12				2					
Congenital malformations (750-759).....	62					1			3	
Certain diseases of early infancy (760-776).....	121									
Senility and ill-defined causes (780-795).....	6									
Accidents, poisonings, and violence (E800-E962).....	156			1				2	1	
Suicide, homicide, etc. (E963-E999).....	14									
All others (241-252, 261-289, 290-299, 300-326, 600-609, 611-749).....	67			3		2	1		1	

separately against the 50 original certificates, the disagreements were 8, 8, and 9, or 16, 16, and 18 percent. Hence, not only did the reviewers agree well among themselves, but each disagreed about equally with the original. Although this test did not provide conclusive evidence that there was no reviewer bias, it was decided to permit each reviewer to work independently on different sets of autopsy protocols and to combine their results for the final analysis.

2. If there should be marked differences between the autopsy and original certificates, how would it be known that it was partly due to the additional data uncovered at autopsy instead of wholly to avoidable errors by the physician who completed the death certificate?

To answer this question, the reviewers, working as a team, studied the ante-mortem clinical

records for 98 consecutive autopsied deaths, agreed upon a medical certification of death for each, and prepared new death certificates without reference to autopsy data. Then they studied the autopsy protocols and prepared another set of certificates based upon all available information. If the certificates prepared from the clinical records did not compare much more favorably with the autopsy certificates than did the original ones, the errors in cause-of-death statements on the originals could not be attributed wholly to avoidable errors by the physician who completed the death certificate.

When the three sets of certificates were compared, it was found that the original and autopsy certificates for 20 (20 percent) of the 98 deaths studied disagreed, but that in only 4 of these did the certificate prepared from the clinical records agree with the autopsy certificate.

# certificate, by cause given on autopsy certificate

numbers, according to autopsy certificate

410-416	420	421-422	430-434	440-443	444-447	450	451-456	460-468	592-594	590-591	490-493	470-527	530-587	610	750-759	760-776	780-795	800-962	963-999	All others	Per- cent of certifi- cates agree- ing
50	267	20	6	19	41	36	24	4	26	9	57	33	181	16	71	111	5	165	12	60	71.0
							7					1	1								93.8
																					25.0
	1						1		1		2	1	5		1	1		1		3	57.1
	6										1									2	92.5
	1											1								1	33.3
	8				2	5			2	1	1		3							1	30.6
2	8			2	8	2			3		5		5	1			1	4		2	59.5
1	1									1	1							1			57.1
3	1					1															0
30	1	2	1				1		1		2										73.2
3	201	8		4	1	14	2				2	5	6	1	1		1	4		4	72.8
1	5	5	1			2			1				2								21.7
2	3	1									1		1		2						0
4	3	1	1	7	13	1	1				2	1						1			17.1
	3			4	9	1			3		1		3								31.0
1	4					4							5								23.5
	1					1	11											1			61.1
								3			1		1					1			37.5
				4			1		12	1		1									52.2
										3			1						2		50.0
	6		2		1	1		1		1	25	1	5		1		1	3			43.9
	2			1		1			1		3	11	3					1		6	33.3
2	5	3	1	1	2	2					5	2	135				1			3	78.9
														10							83.3
											1				52	3		1		1	83.9
												2	1		13	105					86.8
										1	2					1			1	1	0
	1				1	1						4	1			1	1	136	5	1	87.2
																		8	6		42.9
1	6								2	1	2	3	3	4	1			3		34	50.7

\* Numbers in parenthesis are category numbers of the sixth revision of the International Lists of Diseases and Causes of Death.

Hence, if the physician had completed the certificate properly on the basis of the ante-mortem evidence, agreement between the original and autopsy certificates would have been only 4 per cent greater. It was concluded that in this sample, taken from a large teaching hospital where physician practices on death certification were good, there was an appreciable amount of new information supplied by autopsy which could refine the cause-of-death statistics.

This study made no attempt to assess the physician error in recording the ante-mortem data for the total group of 1,889 cases separately from the error due to inadequate information. The methodological study mentioned above was taken as an indication that a sizable portion of the difference between the autopsy and the

original certificates was due to additional data found at post mortem.

## Cause-of-Death Comparisons

Table 1 shows the deaths tabulated by cause groups, both by the original coding and the coding of the autopsy certificates. As can be seen, inaccuracies in the original cause-of-death statement led to an overstatement or understatement of the importance of several major causes of death. For instance, the use of autopsy data changed the number of deaths from tuberculosis (001-019) from 48 to 56. Since the deaths studied were not a representative sample of deaths in the State, this finding cannot be considered as proof that the death rate from tu-

berculosis as given by the reports of the New York State Department of Health is too low. It merely suggests that there may be some underreporting of deaths due to tuberculosis.

Although the number of deaths from syphilis and its sequelae (020-029) was numerically small, there was a significantly large difference in the number of deaths from this cause when the autopsy data were used. Furthermore, an investigation of the incorrectly allocated certificates showed that the difference could be attributed to deaths from "aneurysm of the aorta." Of the 8 deaths ascribed to this cause on the original certificate, 7 of them were found at autopsy to be nonsyphilitic. Three of these certificates had been queried to discover whether or not the aneurysm was syphilitic, but the physician certifying the death in each case had not replied to the query. If this practice of listing "aneurysm of the aorta" as the cause of death occurs throughout the State, many of the deaths attributed to syphilis are wrongly allocated.

The cardiovascular renal group as a whole (330-334, 400-468, and 592-594) showed little change, although there were many differences within the group. The number of deaths attributed to general arteriosclerosis (450) showed a significantly large increase when autopsy data were used. The hypertensive heart disease group (440-443), in particular, showed a significantly large decrease. The lack of

clinical information or the lesser attention given to this group of diseases by pathologists may be a partial explanation for these differences, as well as for the significantly large decrease in the proportion of deaths attributed to diabetes mellitus (260). In certifying these deaths, the physician may have given more weight to clinical information than did the pathologist.

Certain categories, such as malignant neoplasms and accidents, were relatively unchanged by the use of autopsy data. The cause of death in these categories seemed to be relatively well reported.

Although the similarity, rather than the difference, in the overall distribution of the two groups of records by cause of death is perhaps the striking factor in table 1, it can be seen from table 2, which shows the distribution of the deaths by the cause given on the original certificate and by the cause given on the autopsy certificate, that the similarity is due in part to compensating errors. Actually, there was complete agreement between the originally coded four-digit cause of death and the four-digit cause coded on the autopsy certificate for only 865, or 45.8 percent, of the deaths. There was agreement for 52.2 percent of the deaths in terms of three-digit codes as used in the International List and for 71.0 percent in terms of the 30 broad cause groups shown in table 2. Thus, slightly more than one-fourth of the deaths were certified in such a way as to be

Table 3. Distribution of deaths by age and sex, upstate New York, 1951, and study group

Age in years	Total number deaths		Males				Females			
			Number deaths		Percent of total		Number deaths		Percent of total	
	Upstate	Study	Upstate	Study	Upstate	Study	Upstate	Study	Upstate	Study
Total.....	75, 632	1, 889	41, 373	1, 250	54. 7	66. 3	34, 259	639	45. 3	33. 7
Under 1.....	3, 725	223	2, 152	122	2. 8	6. 5	1, 573	101	2. 1	5. 3
1-14.....	1, 190	72	702	38	. 9	2. 0	488	34	. 6	1. 8
15-24.....	898	47	624	35	. 8	11. 9	274	12	. 4	. 6
25-34.....	1, 460	72	834	42	1. 1	2. 2	626	30	. 8	1. 6
35-44.....	3, 083	130	1, 783	83	2. 4	4. 4	1, 300	47	1. 7	2. 5
45-54.....	6, 964	313	4, 287	226	5. 7	12. 0	2, 677	87	3. 5	4. 6
55-64.....	13, 556	422	8, 449	304	11. 2	16. 1	5, 107	118	6. 8	6. 2
65-74.....	19, 082	382	10, 777	254	14. 2	13. 4	8, 305	128	11. 0	6. 8
75-84.....	18, 179	194	8, 702	124	11. 5	6. 6	9, 477	70	12. 5	3. 7
85 and over.....	7, 495	34	3, 063	22	4. 1	1. 2	4, 432	12	5. 9	. 6

classified in a different major group, but compensating errors did decrease these differences, as shown in table 1.

The deaths allocated to pneumonia are a good example of the compensating effect of the differences in allocating causes of death on the two groups of certificates. According to the original certificate, there were 57 deaths from pneumonia among the 1,889 studied. There were also 57 deaths attributed to pneumonia on the autopsy certificates, but only 25 of these 57 were the same ones. In other words, less than one-half of the deaths attributed to pneumonia were actually due to pneumonia according to the autopsy report, but other errors completely compensated for this error.

### Characteristics of Study Group

As previously mentioned, the deaths included in this study are not a representative sample of all deaths in upstate New York, nor are the hospitals in which they occurred a representative sample of all hospitals.

Table 3 shows the differences in the age and sex composition of the study group and of all deaths in upstate New York in 1951. There is a lower proportion of deaths in the study group at ages 65 years and over for males and at ages 55 years and over for females. Table 4 shows some marked differences in the distribution of deaths by cause for the study group and for all deaths. These differences undoubtedly occurred because deaths from certain causes are selectively autopsied. The great underrepresentation of deaths due to heart disease in the study group indicates that the conclusion regarding the inaccuracy of reporting of death due to this cause is conservative. One might expect that the differences between the stated and "true" cause of death among nonhospital heart disease deaths would be greater than among the study group since physicians attending persons dying at home from heart disease may have seen their patients only in the terminal stages and may not have had access to the diagnostic facilities of a modern hospital.

Tables 5 and 6 show the proportion of the deaths in upstate New York in 1952 that occurred in a hospital and the proportion that came to autopsy. The percentage of the deaths

from such conditions as cancer, tuberculosis, acute nephritis, and diseases of the digestive system occurring in hospitals is much higher than the percentage of deaths from such a cause as heart disease. Of all causes of death, cancer, tuberculosis, pneumonia, diseases of the digestive system, accidents, and some of the diseases of infancy stand out as those selectively brought to autopsy. On the other hand, several extremely significant causes of death, such as arteriosclerotic heart disease, diabetes, and vascular lesions affecting the central nervous system, are decidedly underrepresented among the autopsied deaths. This latter group of disorders is frequently difficult to diagnose and is often found in association with many other degenerative processes. That the cause-of-death data in the degenerative diseases lack a firm basis is further substantiated by the data in tables 7 and 8. At the older ages when these diseases are particularly prevalent, the proportion of all deaths autopsied is especially low.

### Discussion

Inaccuracies in cause-of-death data may occur because:

1. The physician does not list the available material correctly on the death certificate.

2. The clinical and laboratory data available before an autopsy is performed are not sufficient to enable the physician to determine the cause of death correctly.

3. In some cases where all information, including the autopsy data, is available, it is still difficult to decide on one underlying cause of death.

The present study did not seek to assess numerically the factor of the physician's ability to record information correctly on the original certificate, although this factor was considered in the analysis of the cause of death among the 98 consecutive autopsies performed in a medical school teaching hospital with excellent attending physicians, house staff, consultants, and laboratory facilities. Using ante-mortem data of unusually high quality, the resulting diagnosis of cause of death on the so-called clinical certificate was quite similar to

**Table 4. Distribution of deaths by cause, upstate New York, 1951, and study group according to original certificate**

Cause of death <sup>1</sup>	Study group		Upstate New York	
	Number	Percent	Number	Percent
Total-----	1, 889	100. 00	75, 632	100. 00
Tuberculosis (001-019)-----	48	2. 54	1, 140	1. 51
Syphilis (020-029)-----	12	. 64	221	. 29
Other infective and parasitic diseases (040-138)-----	28	1. 48	243	. 32
Malignant neoplasms (140-205)-----	402	21. 28	12, 047	15. 93
Other neoplasms (210-239)-----	15	. 79	225	. 34
Diabetes mellitus (260)-----	36	1. 91	1, 400	1. 85
Vascular lesions affecting central nervous system (330-334)-----	131	6. 93	8, 034	10. 62
Various diseases of sense organs (340-399)-----	21	1. 11	670	. 89
Rheumatic fever (400-402)-----	5	. 26	87	. 11
Chronic rheumatic heart disease (410-416)-----	41	2. 17	1, 071	1. 42
Arteriosclerotic heart disease (420)-----	276	14. 61	21, 916	28. 97
Chronic endocarditis (421, 422)-----	23	1. 22	4, 875	6. 44
Other diseases of heart (430-434)-----	10	. 53	633	. 84
Hypertension with heart disease (440-443)-----	41	2. 17	3, 729	4. 93
Hypertension (444-447)-----	29	1. 54	638	. 84
General arteriosclerosis (450)-----	17	. 90	1, 987	2. 63
Other diseases of arteries (451-456)-----	18	. 95	270	. 36
Other diseases of circulatory system (460-468)-----	8	. 42	139	. 18
Chronic and unspecified nephritis (592-594)-----	23	1. 22	959	1. 27
Acute nephritis and nephrosis (590, 591)-----	6	. 32	95	. 13
Pneumonia, except pneumonia of newborn (490-493)-----	57	3. 02	1, 534	2. 03
Other respiratory diseases (470-527, excluding 490-493)-----	33	1. 75	868	1. 15
Diseases of digestive system (530-587)-----	171	9. 05	2, 785	3. 68
Hyperplasia of prostate (610)-----	12	. 64	291	. 38
Congenital malformations (750-759)-----	62	3. 28	927	1. 23
Certain diseases of early infancy (760-776)-----	121	6. 41	2, 371	3. 13
Senility and ill-defined causes (780-795)-----	6	. 32	241	. 32
Accidents, poisonings, and violence (E800-E962)-----	156	8. 26	3, 929	5. 19
Suicide, homicide, etc. (E963-E999)-----	14	. 74	872	1. 15
All others (241-252, 261-289, 290-299, 300-326, 600-609, 611-749)-----	67	3. 54	1, 405	1. 87

<sup>1</sup> Numbers in parentheses are category numbers of the sixth revision of the International Lists of Diseases and Causes of Death.

that made by the physician on the original certificate. Nevertheless, there existed a large difference between either the clinical or original and the autopsy certificate. This study emphasized the source of inaccuracy listed as number 2, that is, the lack of sufficient information to determine the "true" cause of death.

It is not possible to compare the results of this study directly with those of the studies by Swartout and Webster or by Korn and Lintz. In both of those studies, cause data were categorized according to the fifth revision of the International List and the Manual for Joint Causes, whereas in this study the underlying cause specified according to the sixth revision of the International List by the person completing the death certificate was accepted by the vital statistics coding unit. Nevertheless, the results are generally similar in that they dem-

onstrate an appreciable degree of inaccuracy in general cause-of-death data.

Epidemiological studies based upon mortality data gleaned from death certificates present elaborate analyses, by age, sex, and other factors, while accepting with little question the accuracy of the basic record itself. Concern over accuracy of the specific measurement of cause of death should precede the question of the association of these causes with certain characteristics of the general population.

The present study points out a paradox: Although a large number of death certificates give an inaccurate cause of death, this error does not necessarily exert a great influence on the overall cause-of-death statistics. Approximately the same number of deaths from cancer, for example, are reported to be due to heart disease as there are heart disease deaths which are at-

tributed to cancer. This observation, however, is made for autopsied deaths among hospitalized patients, and the same compensating effect of the errors may not be found for other deaths. Within certain cause-of-death classifications, the assignment by the physician of the underlying cause of death seems to behave like a statistically random process. Even if this group of deaths were a representative sample of all

deaths in New York State, the autopsy results would change the cause-specific death rates significantly in only a few of the categories; namely, syphilis, diabetes, hypertension with heart disease, generalized arteriosclerosis, and hypertension.

Although such a compensating mechanism may give us more confidence in the overall mortality statistics, it raises serious doubts about

**Table 5. Hospital and autopsied deaths among males, by cause, upstate New York, 1952**

Cause of death <sup>1</sup>	Total		Hospital deaths			Hospital autopsied deaths		
	Number deaths	Per cent	Number deaths	Percent of total deaths	Percent of total hospital deaths	Number deaths	Percent of total deaths	Percent of total hospital autopsied deaths
Total-----	43, 352	100. 0	25, 206	58. 1	100. 0	7, 049	16. 2	100. 1
Tuberculosis (001-019)-----	769	1. 8	673	87. 5	2. 7	293	38. 1	4. 2
Syphilis (020-029)-----	161	. 4	137	85. 1	. 5	42	26. 1	. 6
Malignant neoplasms (140-205)-----	6, 270	14. 5	3, 932	62. 7	15. 6	1, 293	20. 6	18. 3
Diabetes mellitus (260)-----	521	1. 2	309	59. 3	1. 2	49	9. 4	. 7
Rheumatic fever (400-402)-----	31	. 1	26	83. 9	. 1	15	48. 4	. 2
Vascular lesions affecting central nervous system (330-334)-----	3, 704	8. 5	2, 333	63. 0	9. 3	329	8. 9	4. 7
Chronic rheumatic heart disease (410-416)-----	512	1. 2	322	62. 9	1. 3	117	22. 8	1. 7
Arteriosclerotic heart disease (420)-----	14, 761	34. 1	6, 605	44. 7	26. 2	1, 318	8. 9	18. 7
Chronic endocarditis (421, 422)-----	2, 174	5. 0	1, 151	52. 9	4. 6	100	4. 6	1. 4
Other diseases of heart (430-434)-----	329	. 8	166	50. 4	. 7	47	14. 3	. 7
Hypertension with heart disease (440-443)-----	1, 596	3. 7	1, 062	66. 5	4. 2	187	11. 7	2. 7
Hypertension (444-447)-----	295	. 7	174	59. 0	. 7	36	12. 2	. 5
General arteriosclerosis (450)-----	873	2. 0	548	62. 8	2. 2	81	9. 3	1. 2
Other diseases of arteries (451-456)-----	184	. 4	130	70. 6	. 5	76	41. 3	1. 1
Other diseases of circulatory system (460-468)-----	87	. 2	60	69. 0	. 2	33	37. 9	. 5
Chronic and unspecified nephritis (592-594)-----	452	1. 0	297	65. 7	1. 2	54	11. 9	. 8
Acute nephritis and nephrosis (590, 591)-----	62	. 1	47	75. 8	. 2	21	33. 9	. 3
Pneumonia, except pneumonia of newborn (490-493)-----	944	2. 2	726	76. 9	2. 9	291	30. 8	4. 1
Diseases of digestive system (530-587)-----	1, 841	4. 2	1, 588	86. 2	6. 3	673	36. 6	9. 5
Hyperplasia of prostate (610)-----	263	. 6	218	82. 9	. 8	53	20. 2	. 8
Congenital malformations (750-759)-----	501	1. 2	445	88. 8	1. 8	240	47. 9	3. 4
Certain diseases of early infancy (760-776)-----	1, 447	3. 3	1, 415	97. 8	5. 6	463	32. 0	6. 7
Senility and ill-defined causes (780-795)-----	119	. 3	37	31. 1	. 1	9	7. 6	. 1
Accidents, poisonings, and violence (E800-E962)-----	2, 682	6. 2	1, 255	46. 8	5. 0	574	21. 4	8. 1
Suicide, homicide, etc. (E963-E999)-----	714	1. 6	141	19. 7	. 6	79	11. 1	1. 1
Other infective and parasitic diseases (030-139)-----	195	. 4	164	84. 1	. 6	80	41. 0	1. 1
Neoplasms (210-239)-----	106	. 2	78	73. 6	. 3	37	34. 9	. 5
Various diseases of sense organs (335-398)-----	367	. 8	239	65. 1	. 9	95	25. 9	1. 3
Influenza and bronchitis (480-483, 500-502)-----	153	. 4	77	50. 3	. 3	31	20. 3	. 4
All others-----	1, 239	2. 9	851	68. 7	3. 4	333	26. 9	4. 7

<sup>1</sup> Numbers in parentheses are category numbers of the sixth revision of the International Lists of Diseases and Causes of Death.

the use of present death-certificate data for research purposes, particularly in the field of chronic degenerative diseases. Epidemiological studies of deaths from heart disease, for example, based on such artifacts must be reexamined to determine whether there are significant biases in the way the errors are associated with the factors under investigation. Material to be used for such studies must first be refined, es-

pecially since the deaths from heart disease are so underrepresented among autopsied deaths.

### Suggestions for Improvement

This study, as well as others cited, indicates a need for the consideration of procedures that will improve the accuracy and, consequently,

**Table 6. Hospital and autopsied deaths among females, by cause, upstate New York, 1952**

Cause of death <sup>1</sup>	Total		Hospital deaths			Hospital autopsied deaths		
	Num- ber deaths	Per- cent	Num- ber deaths	Percent of total deaths	Percent of total hospital deaths	Num- ber deaths	Percent of total deaths	Percent of total hospital autopsied deaths
Total-----	36, 198	100. 1	21, 647	59. 8	99. 9	4, 174	11. 5	99. 6
Tuberculosis (001-019)-----	269	. 7	229	85. 1	1. 1	74	27. 5	1. 8
Syphilis (020-029)-----	68	. 2	54	79. 4	. 2	12	17. 6	. 3
Malignant neoplasms (140-205)-----	5, 991	16. 6	3, 532	59. 0	16. 3	781	13. 0	18. 7
Diabetes mellitus (260)-----	955	2. 6	613	64. 2	2. 8	83	8. 7	2. 0
Rheumatic fever (400-402)-----	31	. 1	25	80. 6	. 1	13	41. 9	. 3
Vascular lesions affecting central nervous system (330-334)-----	4, 770	13. 2	2, 787	58. 4	12. 9	269	5. 6	6. 4
Chronic rheumatic heart disease (410- 416)-----	575	1. 6	355	61. 7	1. 6	123	21. 4	2. 9
Arteriosclerotic heart disease (420)-----	10, 116	28. 0	5, 386	53. 2	24. 9	651	6. 4	15. 6
Chronic endocarditis (421, 422)-----	2, 234	6. 2	1, 093	48. 9	5. 0	56	2. 5	1. 3
Other diseases of heart (430-434)-----	262	. 7	125	47. 7	. 6	22	8. 4	. 5
Hypertension with heart disease (440- 443)-----	2, 195	6. 1	1, 344	61. 2	6. 2	184	8. 4	4. 4
Hypertension (444-447)-----	301	. 8	161	53. 5	. 7	29	9. 6	. 7
General arteriosclerosis (450)-----	1, 073	3. 0	576	53. 7	2. 7	60	5. 6	1. 4
Other diseases of arteries (451-456)-----	87	. 2	63	72. 4	. 3	37	42. 5	. 9
Other diseases of circulatory system (460-468)-----	71	. 2	43	60. 6	. 2	21	29. 6	. 5
Chronic and unspecified nephritis (592-594)-----	426	1. 2	242	56. 8	1. 1	39	9. 2	. 9
Acute nephritis and nephrosis (590, 591)-----	48	. 1	41	85. 4	. 2	10	20. 8	. 2
Pneumonia, except pneumonia of new- born (490-493)-----	705	1. 9	506	71. 8	2. 3	149	21. 1	3. 6
Diseases of digestive system (530-587)-----	1, 239	3. 4	1, 029	83. 0	4. 8	386	31. 2	9. 2
Hyperplasia of prostate (610)-----	0	0	0	0	0	0	0	0
Congenital malformations (750-759)-----	428	1. 2	359	83. 9	1. 7	186	43. 4	4. 5
Certain diseases of early infancy (760-776)-----	982	2. 7	954	97. 1	4. 4	292	29. 7	7. 0
Senility and ill-defined causes (780- 795)-----	105	. 3	39	37. 1	. 2	10	9. 5	. 2
Accidents, poisonings, and violence (E800-E962)-----	1, 362	3. 8	866	63. 6	4. 0	214	15. 7	5. 1
Suicide, homicide, etc. (E963-E999)-----	233	. 6	49	21. 0	. 2	31	13. 3	. 7
Other infective and parasitic (030-139)-----	142	. 4	120	84. 5	. 6	60	42. 2	1. 4
Neoplasms (206-239)-----	127	. 4	97	76. 4	. 4	46	36. 2	1. 1
Various diseases of sense organs (335- 398)-----	329	. 9	220	66. 9	1. 0	56	17. 0	1. 3
Influenza and bronchitis (480-483, 500-502)-----	127	. 4	69	54. 3	. 3	25	19. 7	. 6
All others-----	947	2. 6	670	70. 7	3. 1	255	26. 9	6. 1

<sup>1</sup> Numbers in parentheses are category numbers of the sixth revision of the International Lists of Diseases and Causes of Death.



the usefulness of cause-of-death data. Presented here are a few suggestions that, it is hoped, local health departments may wish to develop further through demonstration projects. The suggestions apply particularly to collection of data which are to be used for epidemiological studies of the degenerative diseases. Emphasized are steps that might be taken to prevent some of the inaccuracies resulting from the absence of post-mortem data at the time the death certificate is filled out, but attention is also given to the improvement of accuracy through correct recording of available data and to the problem of multiple causes of death.

#### *Obtaining Post-Mortem Data*

One possible method of correcting inaccurate cause-of-death statements would be for the pathologist to send a copy of each autopsy summary to the local health department. This practice might be of help in resolving many of the questions posed by the present medical certifications, and it should reduce the number of certificates requiring queries to the attending physician. Many deaths, of course, do not go to autopsy, but the provision of an autopsy summary for those that do should increase the body of trustworthy data.

Another possible approach would be the re-vamping of procedures for correcting medical

**Table 7. Hospital and autopsied deaths among males, by age, upstate New York, 1952**

Age in years	Total number deaths	Hospital deaths		Hospital autopsied deaths	
		Number	Percent of total	Number	Percent of total
Total	43, 352	25, 206	58. 1	7, 049	16. 2
Under 1	2, 293	2, 033	88. 7	801	34. 9
1-14	718	404	56. 3	209	29. 1
15-24	585	290	49. 6	134	22. 9
25-34	919	518	56. 4	247	26. 9
35-44	1, 820	1, 021	56. 1	434	23. 8
45-54	4, 379	2, 400	54. 8	872	19. 9
55-64	8, 964	5, 125	57. 2	1, 722	19. 2
65-74	11, 275	6, 333	56. 2	1, 544	13. 7
75-84	9, 265	5, 329	57. 5	899	9. 7
85 and over	3, 134	1, 743	55. 6	187	6. 0

**Table 8. Hospital and autopsied deaths among females, by age, upstate New York, 1952**

Age in years	Total number deaths	Hospital deaths		Hospital autopsied deaths	
		Number	Percent of total	Number	Percent of total
Total	36, 198	21, 617	59. 8	4, 174	11. 5
Under 1	1, 611	1, 421	88. 2	520	32. 3
1-14	539	366	67. 9	175	32. 5
15-21	264	163	61. 7	71	26. 9
25-34	645	460	71. 3	207	32. 1
35-44	1, 229	801	65. 2	274	22. 3
45-54	2, 607	1, 655	63. 5	447	17. 1
55-64	5, 256	3, 162	60. 2	696	13. 2
65-74	9, 081	5, 357	59. 0	914	10. 1
75-81	10, 182	5, 736	56. 3	684	6. 7
85 and over	4, 784	2, 524	52. 8	186	3. 9

certifications of the cause of death after the certificate has been filed. Some States, with legal considerations in mind, have made it difficult to make changes in the cause-of-death statement, often requiring the physician to submit special legal forms. As a first step, arrangements might be made for public health administrators to obtain changes, even if the "legal" certification of death remains the same. Physicians and hospital record rooms could be encouraged to submit supplemental unofficial data on deceased patients when such information effects a significant change in the cause of death already recorded. At least one registration area (New York City) is now employing a certificate form in which the medical portion of the record is filed separately from the "legal" portion.

Some improvement in accuracy of medical certification of cause of death can probably be made by increased efforts to educate physicians to evaluate the various pathological factors properly and to communicate their decisions accurately by means of uniform disease terms, as well as to complete the certificate accurately. Local health agencies should renew their interest in these problems. By maintaining alert, medically oriented querying programs, they can insure that physicians correct and adjust the causes of death. The daily sheaf of death certificates passing through the local health



unit should be examined by a person with medical training, one who can select those requiring followup. In addition, arrangements might be made for the health agency to receive routine reports or periodic samplings of post-mortem examinations as a guide in taking steps to correct inaccurate cause-of-death data in those records forming a basis for the agency's programs.

### *The Problem of Multiple Causes*

The present study suggests also the need for changes in the methods of collecting and analyzing mortality data if such data are to be used for epidemiological studies of chronic disease. Even among the patients dying from these chronic diseases who are autopsied, the problem of sorting out a single underlying cause is not simple. In many of these cases, several degenerative processes have been at work, and it is sometimes difficult to attribute death to a single underlying cause. With the present aging of the population and the decrease of communicable disease fatalities, the problem of multiple degenerative processes is increasing proportionately so as to overshadow all of the excellent steps taken so far to improve cause-of-death reporting. This situation is responsible for the third type of inaccuracy in cause-of-death data mentioned above.

If present trends continue, an ever-increasing number of deaths will be attributable to any of several combinations of diabetes, hypertension, pulmonary fibrosis, atherosclerosis, heart disease, obesity, cirrhosis, senility, nephritis, and cerebral hemorrhage. The exact one of these recorded as the primary cause will often be largely a matter of the physicians' opinions of the sequence of the processes. Even pathologists observing end results with all available clinical data at hand can hardly be expected to be consistent and infallible in arranging disease patterns so as to select the underlying cause. Moreover, even if the "true" cause of death were, for example, cerebral hemorrhage, perhaps the only public health control measure available to postpone its occurrence would be an attack against an accompanying hypertension, diabetes, obesity, or nephritis. Public health recognizes that chronic diseases seem more often due to diffuse multiple causes than

to specific ones. The weakest link in the chain of disease, the best potential point for attack, may reside in an attribute rarely or inadequately counted among the pathological conditions associated with fatal illness. Moreover, the present reporting system prevents us from being able to study the total prevalence of certain serious conditions at time of death. An awareness of these facts may be partly the reason for the current emphasis on morbidity instead of mortality surveys in a search for epidemiological factors in chronic disease.

For these reasons, physicians and pathologists might record not only the underlying cause of death on the death certificate, but whatever data are available on the type and duration of each 'pathological' or pathophysiological condition present. A real challenge awaits specific local health units who wish to explore this possibility on a pilot basis. Preliminary studies based upon multiple cause analysis of routinely submitted certificates are interesting. Sagen and Vinyard (5) report that in all diseases except tuberculosis, malignant neoplasms, other diseases of the heart, and accidents, at least 50 percent of the death certificates they reviewed indicate a multiple cause. The diabetes group had the largest proportion, 87 percent, with multiple causes. Such data, however, are not as meaningful as they would be had the reporting physician been instructed to list all pathology which was present, since under current practice it is common to omit listing some conditions in completing a death certificate. The available space for the medical certification is too limited to permit the inclusion of all the many pathological processes which may be involved, a fact which suggests that the certificate might be redesigned or supplemented for special studies in selected areas. Thought might be given to including on the reverse of such death certificates a checklist of the medical conditions which are important to modern public health practice.

### **Summary**

1. Autopsy protocols for 1,889 consecutive deaths occurring during 1951 and 1952 in 12 hospitals in the area of Albany, N. Y., were reviewed, and new death certificates were prepared from the autopsy information. These

certificates were coded and compared with the original certificates on file in the New York State Department of Health.

2. When causes of death given on the original certificates were matched with the "true" cause as determined at autopsy, the errors in the original certificates were often found to be compensating. Despite such a compensating effect, the extent of the error in a large number of specific cases raises serious doubts as to the validity of the use of cause-of-death data as a basis for epidemiological studies of degenerative diseases.

3. Certain of the degenerative diseases which figure importantly as causes of death, such as arteriosclerotic heart disease, diabetes, and vascular diseases of the central nervous system, are decidedly underrepresented among the deaths autopsied. For these causes, the percentage agreement between the original death certificate and the autopsy certificate was 72.8, 30.6, and 59.5, respectively. The fact that a large number of such deaths do not occur in hospitals suggests that even greater errors exist in the present mortality data for these conditions.

4. Suggestions made for improving the accuracy of cause-of-death data include more querying of physicians, submission of autopsy summaries to local health departments, encouraging physicians to report additional data after the death certificate has been filed, redesign of the death certificate, and analysis of multiple causes of death after physicians have been instructed to report all of the pathological conditions present at time of death.

5. Programs for improving the accuracy of cause-of-death data should be developed through local demonstration projects in order to improve the practicability and usefulness of the resulting data for epidemiological studies in the degenerative diseases.

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#### REFERENCES

- (1) Swartout, H. O., and Webster, R. G.: To what degree are mortality statistics dependable? *Am. J. Pub. Health* 30: 811-815 (1940).
- (2) Dunn, H. L.: What is the role of the health officer in improving cause-of-death statistics? Presented at the New York State Annual Health Conference, 49th, Lake Placid, N. Y., June 2, 1953.
- (3) Pohlen, K., and Emerson, J.: Errors in clinical statements of cause of death. *Am. J. Pub. Health* 32: 251-260 (1942).
- (4) Korns, R. F., and Lintz, W. B.: Death certificate-autopsy non-correlations study, 1949. Unpublished material of the New York State Department of Health.
- (5) Sagen, O. K., and Vinyard, J. N.: Preliminary report on the tabulation and analysis of deaths due to multiple causes. Report of the Working Committee on Mortality Statistics, Fourth Annual Meeting of the Public Health Conference on Records and Statistics, March 1952. Washington, D. C., The Committee, 1952.

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*An official of the Foreign Operations Administration discusses some of the broad considerations which underlie the United States technical cooperation programs as they relate to the health problems in the underdeveloped areas of the world.*

## Health in Foreign Operations

By JOHN H. STAMBAUGH

THROUGH the Foreign Operations Administration, the United States is working with about 60 other nations to build the mutual security of the free world. We are doing this through joint defense undertakings, through increasing economic strength, and through the sharing of modern techniques.

Under the mutual security program, the defenses of the free nations are growing; the North Atlantic Treaty Organization is now a strong deterrent to Communist aggression in Western Europe. By 1953, NATO had increased the number of its active divisions threefold over 1951 and had more than doubled its aircraft strength. In 1953, the free world's economic strength reached its highest point since the end of World War II.

The United States is cooperating with the peoples of the less developed areas of the world to help build their technical knowledge and skills, with primary emphasis on projects in health, agriculture, and education. Under

President Eisenhower, this cooperation has been increased. More United States technicians are serving abroad than ever before.

Long before the United States Government, through the Institute of Inter-American Affairs and later through the Act for International Development, entered this field of sharing technical knowledge, many private organizations and institutions of the United States were actively working with the people of other countries. Voluntary agencies, foundations, colleges, commercial firms, and church groups were—and still are—carrying out a host of projects abroad. Their work has been notable, especially in the field of health. Through the medical missionary, for example, several thousand dispensaries and hundreds of hospitals have been set up and are daily helping the people of other countries.

The technical cooperation programs of the Foreign Operations Administration, however, are carried out in a different way from the programs of private groups. A church mission may maintain a hospital; a foundation may conduct essential research; an American business firm may provide health care for its employees from the surrounding area in a foreign country. But by their very nature these projects must operate in limited areas. The scope of FOA activity is much broader. This agency works with the governments of the host countries on programs which will eventually result

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*Mr. Stambaugh is assistant to the director of the Foreign Operations Administration. Presented here are excerpts from his address before the Midwest Conference on World Health, held in Chicago, June 10-11, 1954. The conference was sponsored by the National Citizens Committee for the World Health Organization.*

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in provision of nationwide governmental service in health and other fields.

In every instance, the United States enters into these cooperative programs only upon request from the individual countries. The initiative for the programs is theirs, not ours: We seek only to help the people to help themselves. Complete responsibility for projects is assumed by the host countries as rapidly as possible. It is important to keep in mind that, while the United States is contributing financially to these joint programs and is sending technicians to help plan and carry them out, the host countries are contributing more than we are, not only in funds but also in personnel and in facilities. Money contributions by the host country, as a matter of fact, average about double the United States' contributions, and in some programs, host-country contributions exceed ours many times—27 times in the health program in Brazil, for instance.

In some of the less developed countries, funds for economic development are made available in addition to technical cooperation. Frequently, these funds supplement technical cooperation by providing supplies and commodities needed to undertake projects or speed up those already undertaken. Where the funds are applied, they permit an increase in the tempo of technical projects.

Guiding principles in the cooperative programs have grown as the programs themselves have developed. In the early days of the health programs in various countries, for instance, matters of immediate emergency were tackled first. The widespread devastating diseases, such as malaria, were attacked on a wide scale. But, as the work proceeded, increasing importance was attached to the development of national health programs to service local areas so that the people themselves could continue to carry on the health work.

### **Training and Health Education**

The United States has given continued attention to the training of local personnel in the techniques and skills necessary to maintain and expand the work once it is under way. This is true for every field of technical cooperation.

Local health workers are trained to the max-

imum extent possible within the country itself, and, in addition, participants in the health programs are brought to the United States for study and for observation of our techniques. Under the Foreign Operations Administration and its predecessor agencies, more than 2,300 technicians in health have received training in the United States. Most of these have returned to take influential positions in their own countries and to help train others in carrying on the programs.

Hand in hand with training has gone the need to acquaint the public of the host country with the programs. In health programs, this has meant developing the acceptance of health practices on the part of the people. It has meant providing health education through every avenue possible, through audiovisual and other information programs, and in conjunction with agriculture and education cooperative programs.

Audiovisual media sometimes do a strikingly good job in informing people about proper health procedures. In one country in the Middle East, during the showing of a film on the care of babies, a husband strode over to his wife and began to belabor her for not having already used the method of baby care which was being shown on the screen.

In another country, in an isolated village, health technicians were surprised to discover one woman—just one—who was taking care of her baby in the manner prescribed by the health team. Inquiry disclosed that her husband had recently been to another village, had seen a film on baby care, and had gone back to see it five times until he had memorized all the procedures so that he could explain them to his wife.

### **Joint Planning**

The Foreign Operations Administration has learned the importance of integrating the different cooperative programs within each country, of relating health projects to agriculture, agriculture projects to health, and so on. Joint staff meetings of the technicians in the different programs in the field have proved beneficial.

In planning one irrigation project, for instance, it was necessary to see that malaria-

bearing mosquitoes did not breed in the canal waters. It was necessary also to use means for the control of snails which are host to a debilitating disease that attacks humans. Joint planning also permits the closer adjustment of crops to nutritional requirements.

The close relationship between health and education projects is obvious, and, particularly in rural areas, health rules become a primary part of basic education.

The development of joint planning has another benefit. It sets a useful pattern for host countries to follow in the long-range handling of their programs after the United States technicians depart.

### **Coordination With Other Agencies**

In all of its technical cooperation activities, the Foreign Operations Administration endeavors to coordinate its programs with those of the United Nations, the Organization of American States, and other agencies in the field. This close relationship is illustrated by the fact that Dr. John J. Hanlon, chief of the Public Health Division of the Foreign Operations Administration, was a member of the United States delegation to the World Health Assembly at Geneva in May 1954.

Although cooperative projects normally are arranged between the host country and the Foreign Operations Administration, in some instances they include a third party. In Ethiopia, the World Health Organization, for example, works with the Foreign Operations Administration and the Ethiopian Government in a health center organized under the Ethiopian Ministry of Health.

In some countries, in campaigns against diseases, the World Health Organization pays particular attention to control of tuberculosis and venereal disease; consequently, either the Foreign Operations Administration's health programs include fewer projects to combat these diseases or FOA attempts to coordinate possible contributions and activities in these fields with those of WHO.

Coordination of projects applies in all fields. A celebrated example is that of the combined efforts to meet the menace of the desert locust in the Middle East. American, British, and

United Nations workers collaborated with the various governments of the area in dusting by airplane and carrying out other means of combating the pest.

### **Importance of Health Projects**

Health projects are among the first in importance in helping the nations of the underdeveloped areas to strengthen their economies and improve the lives of their people. Strong, able bodies can better open the way to a successful attack on the other problems of a national economy.

Most of the people in the less developed countries make their living from the land. In countries where the people suffer from malaria, they lack the energy to produce in abundance even with improved techniques. Good food may be essential to good health but, on the other hand, good health is a prime requisite in the improvement of agriculture.

The severe drain of disease upon the constructive potential of a nation can be readily dramatized by a few figures. It was estimated a few years ago, for instance, that an annual number of 100,000,000 cases of malaria in India meant that about 9 billion man-days of labor were lost each year. If the inroads made by disease upon productive energies of peoples in the less developed countries of the free world each year were totaled, the figures would be astronomical and almost beyond comprehension.

The conquering of major endemic diseases in these areas thus has its vital economic aspect, as well as a strong humanitarian appeal. It makes better workers of the people and permits them to become more self-sufficient. It also makes of them an increasingly better market in the commerce among nations. They become additions to rather than a loss from world production and trade, and they strengthen the economies of their own nations.

Health projects were among the first begun under our technical cooperation programs. They have reached scores of millions of people all over the world. In Latin America alone, where the work got an early start, more than 20 million persons have directly benefited.

The programs have included measures to solve environmental problems—sanitation, water supply, sewage disposal, and control of insects. They have included the development of health centers, nursing schools, and hospitals. These activities are mentioned to indicate the many different kinds of specialists needed in the field of health. At present, the United States foreign health programs could use at least 100 additional specialists.

### The Long-Term Goal

There are both an immediate and a long-term objective in these cooperative programs. The United States wants to help overcome the great scourges that afflict these people, but it wants also to help them establish services for the continued control of disease and for maintaining improved health standards on a permanent basis. These programs help, not only in meeting immediate needs, but also in building the mutual security of the free world.

To achieve the long-term goal, the Foreign Operations Administration is gearing its cooperative efforts to the overall economic development of the host countries. By so doing, the host countries are better able to continue the operations under their own supervision and financing when the techniques have been adequately demonstrated. More and more projects in health, agriculture, education, and other fields are being integrated into balanced programs, with the long-term goal in mind. By experience, it has been learned that although there may be excellent programs in each of these fields, they are not fully effective in helping the host country toward its broad objectives unless they are carefully coordinated.

Nationwide social and economic development cannot take place simply on the basis of functional segments thrown together into a conglomeration of disparate projects, no matter how worthy the purpose of any single project nor how well any one project may be managed. Human and material resources are so closely related to a nation's economic growth and political future that development of all these resources must be integrated as wisely as human knowledge and ability can manage.

If technical skills are to be shared and developed, there must be education.

If knowledge is to be used to build industry, there must be the capacity to produce.

If production is to take place, the workers must have vigor.

Vigor depends upon proteins.

Proteins become available through the efforts of healthy and productive farmers and fishermen.

Education—industry—health—agriculture—each of these separate fields is in itself worthy. Work in each field, however, becomes most effective when geared to operations in all other fields.

One program in which the various factors involved in economic development are given consideration is the area development plan now under way in three provinces around the city of Concepción, Chile. This program permits the concentration of available personnel and funds on a single endeavor rather than spreading them countrywide. Serving as a demonstration activity it provides a base on which other regional developments can be planned.

Another regional program, now operated by the government of the host country, was developed in the Amazon basin of Peru. It includes 6 hospitals, 2 health centers, 4 dispensaries, and a number of motor launches to carry health personnel to outlying districts.

### Emergency Food Operations

Closely related to health projects are the emergency food operations of the Foreign Operations Administration. When an economic emergency arose in Bolivia in the fall of 1953, President Eisenhower took action to authorize the sending of \$5 million in surplus agricultural commodities to help meet the food deficit of the country, and another \$3 million was authorized in March 1954.

Emergency wheat shipments to Pakistan were begun in 1953 to counter the threat of famine in the wake of severe droughts. More than 600,000 tons of wheat had been shipped by late April 1954, when the Pakistan Government announced that the crisis had been met. The Pakistan Government reported that the shipments had saved millions of lives.

During the summer and fall of 1953, more than 5½ million food packages were provided for persons in the Soviet Zone of Germany and East Berlin. Nearly a million East Germans crossed the lines into West Berlin to pick up the food. About 4½ million food parcels were distributed in 1953 in Spain, Italy, Austria, West Germany, and Greece, and in many Middle Eastern and South American countries.

These emergency operations, like the health programs, are an essential part of the United States' effort to build strength and stability throughout the free world.

### **Toward Peace and Progress**

All the programs of the Foreign Operations Administration—whether for the sharing of modern techniques, for increasing economic strength, or for joint defense against aggression—combine to help build toward world peace and progress. Our goals are worthy, our methods are honorable and open, our offer of partnership is firm. The United States wants to help other nations to develop their own resources for the good of their peoples and to strengthen their own security and independence. In their strength, we ourselves are strengthened.

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### **Tenth National Conference on Rural Health**

The 10th National Conference on Rural Health, sponsored by the Council on Rural Health of the American Medical Association, will be held February 24-26, 1955, in Milwaukee, Wis. Introducing the theme of the conference, "Looking Both Ways," will be an address by Dr. F. S. Crockett, chairman of the Council on Rural Health. Physicians and farm and community leaders will participate in the 3-day program, which is centered around several broad topics: farm and home safety, recreation, family responsibility for health, use of present health and medical care resources, and rural health and world peace.

# School Health Education in Dearborn

## —A Growing Program—

By FRANK H. JENNE, M.P.H.

FOUR YEARS AGO the school health program in Dearborn, Mich., was primarily service-centered. Since then it has become education-centered, and it continues to grow in that direction.

The same general division of functions between the school and city health departments that existed in 1950 before a study was made is maintained today, except that the schools have vacated the treatment field. Each department has its own nursing staff. The school nurses are responsible for health education and health counseling in the schools, and for followup on school screening programs. The city is responsible for communicable disease control. The city health department provides environmental health service to the schools. It also serves as a channel for the school health department to the specialized services of the State health department. The entire relationship is maintained by frequent conferences between the directors of the two departments and through the Dearborn Community Health Council and the School Health Advisory Council.

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In recent years the Dearborn Community Health Council has been making a determined effort to strengthen the city health department's staff and facilities. An advisory public health commission has been established as a result of this activity and several new city nursing positions have been created. The health council's eventual goals include a laboratory, health educator, and a suitable health center for the city department, and a board of health with legal authority.

It was in 1950 that the School Health Advisory Council of Dearborn, including the board of education, school staff members, and parent and community representatives, studied the old program with a group of consultants from the University of Michigan School of Public Health. The study laid for the schools this philosophical footing for the new approach:

"The modern concept of education requires that we accept responsibility for the development of the whole child. Certainly, then, this includes the physical well-being of all children. Since we are an educational institution, our health program should be aimed primarily toward (a) providing that health knowledge which will result in desirable health attitudes and behavior, (b) providing a proper foundation for intelligent choices on the part of the individual so far as his own personal health is concerned, (c) discovering physical defects, and (d) exerting every effort to see that the remediable defects are corrected.

"The school is expected to assume responsi-



bility for the health instructional program and the development of desirable health attitudes and behavior. The school, cooperatively with the parents and family physician and dentist, is responsible also for the detection of physical defects.

"In the matter of treatment, however, it is the policy of the Dearborn city school district that this should be left to the family physician and dentist always keeping in mind that there will be a fringe of medically indigent families for whom treatment assistance must be secured."

The school health department's activity programs—roundup, screening, health appraisal, and topical fluoride—rest solidly on this footing as educational projects. Conversely, the health education program is largely one of activities. Parent as well as pupil participation results in carryover to the home, community support for the program, and material assistance in reducing the workload of the school nurses and teachers. Description of various phases of school health in Dearborn in light of these concepts will indicate the present status in the growth of the program.

### **Kindergarten Roundup**

Roundups are held in the spring for pupils entering kindergarten in the fall and in the first semester for those entering in the second semester. The most successful programs from the standpoint of attendance are those to which parents receive a personal invitation from a parent worker. In one school in a growing neighborhood parent block workers ring doorbells of newly occupied homes and in this way obtain the attendance of parents not known through the school census. Often, this call represents the first contact in a new community and results in the recruitment of new parent-teacher organization members before they become involved in other social or civic activities.

The most successful roundups from the standpoint of program are those that are planned by the building roundup committee with guidance from the principal and nurse, and at which the parent roundup chairman, rather than the principal, presides.

The purpose of the roundup is to provide a happy introduction to all phases of the school

program and to assist parents in preparing children for school. The principal, school nurse, visiting teacher (who is a trained social caseworker), and kindergarten teacher each has a part in the program. The nurse distributes and explains the personal health history form to be filled out by the parent and the health appraisal forms to be filled out by the family physician and dentist. She provides some general information about school health policies and the health needs of the school child. The social hour following the program gives her an opportunity to answer some personal questions and begin to get acquainted with the new parents.

Later, when the mother comes for her enrollment interview with the teacher, she has a "get-acquainted" interview with the school nurse or with the city health department district nurse who conducts the interviews in one building while the school nurse is busy in another. In the interview the nurse may obtain pertinent health information about the child which the parent or physicians have neglected to mention on the health form. She may also find parents who have neglected to have a health appraisal done and encourage them to do so. She may steer them to a community facility such as the city physician if that is indicated.

In this way, 95 percent of the entering kindergarteners had medical health appraisals in 1953-54. Ninety-three percent had complete immunizations. Eighty percent had a dental health appraisal, and 23 percent had topical fluoride applications before coming to school.

The number of fluoride applications approximately doubled, as a result of the city health department's 1953 summer fluoride program for preschool children. The school health department loaned its equipment and helped plan the project. Stations were set up in schools. Unfortunately, the program was not continued in 1954. It may be possible to give the service again in 1955 and enlist the support of the schools' parent health workers in increasing participation.

### **Screening: Vision and Hearing**

The first activity after kindergarten interviews in the fall is vision screening. This is

carried out by the teachers with parent help under the guidance of the nurse. Units in eye health are taught and include such pupil activities as children measuring the light on their desks and preparing posters on eye health. The screening method used is the Snellen "E" chart with plus sphere lenses. Rechecks are made by the nurse before referral. The procedure was worked out with the help of the Michigan State Department of Health consultant and local ophthalmologists. Vision screening is scheduled for the junior primary through grade 6, and again in grades 8 and 10 and the first year of college. In college, the vision screening tests are carried out by a student committee with the guidance of the nurse.

Hearing screening follows much the same organizational and educational pattern as vision screening, except that it is performed by an audiometrist. Pamphlet materials and guides to visual aids for teacher use provided by the State health department are distributed by the nurse to teachers in grades 3, 6, 9, and 12 before the screening begins.

### Sodium Fluoride Applications

Preparation for the sodium fluoride program begins with a building committee which may include the teachers, student representatives, parents, the principal, and the nurse. It is the committee's job not only to sell the program to parents and children but also to set up activities that will result in improved dental health practices.

Pupils make posters advertising the fluoride program and display them in the building. The program is often explained to parents at meetings as well as through letters. Second graders write and produce puppet shows and give toothbrushing demonstrations with the large tooth-and-brush models at meetings attended by their parents. After the show, tasty and attractive but healthful refreshments are served. The dental hygienist may be invited in to help a grade 5 class with its project. Eighth graders may collect specimens for lactobacillus counts and send them to the Michigan Department of Health laboratory. In general, the activities of the younger pupils are at the level of drama and imitation, and such children de-



Figure 1. "Mother" brings "child" to "family doctor" for a health appraisal.

light in the mastery of the process of toothbrushing. Older pupils are more interested in the technical and scientific aspects of dental health.

The topical fluoride program has become well known to many parents since its beginning in 1950. Several parent groups have therefore held programs on water fluoridation with speakers supplied by the local dental society.

Slightly more than 90 percent of the pupils in the eligible grades accept the fluoride applications. Eighth grade pupils sign the request form themselves, in addition to obtaining their parents' signatures. This gives them a chance to exercise some responsibility for their own health. The school nurse refers indigent children to the city health department dental clinic for needed care.

### Health Appraisal

One of the specific objectives of Dearborn's health education program is to establish the attitude that periodic medical and dental check-ups are an important part of healthful living. After the first health appraisal upon entering kindergarten—or the school system for the first time—additional examinations by the family doctor and dentist are asked for in grades 3, 7, and 10, and the first year of college.

Educational preparation for this event at the lower grades includes the use of visual aids, the nurse or a neighborhood physician as a resource person, and role-playing, by the pupils, of examination procedures (fig. 1). At the high

school level, students prepare and present panel discussions on health appraisal in their English classes. In junior high school, an instructional unit is given by the physical education teacher. This unit seeks first to motivate the student to have an appraisal. It also discusses the physician-patient relationship, the problem of selecting a physician, and quackery. Correlated activities are also carried out by the art, science, homemaking, and "block of time" (English and social studies) teachers.

Orientation programs for pupils entering high school (grade 10) and their parents were developed this past year. They follow to some extent the objectives and pattern of the kindergarten roundup. This activity gives the nurse an opportunity to explain the health appraisal to parents who are no longer active in parent-teacher associations and other school activities. In fact, the orientation programs resulted in considerable parent interest in developing increased parent participation at the secondary level.

The health appraisal program recognizes the fact that junior and senior high school students take increased responsibility for their own health care and that the college freshman is almost solely responsible. In practice, medical appraisals are obtained by 60 to 75 percent of the pupils in grades 3 and 7. This jumps to 97 percent in grade 10 and 90 percent in first year of college. Thirty to forty percent have dental appraisals. One reason for the high 10th grade participation is the reluctance of physical education teachers to permit strenuous activity without the protection of a health appraisal report.

The health appraisal includes a personal health history filled out by the pupil and his parent. Instead of a checklist of procedures, the physician's portion of the form contains questions designed to reveal conditions of which the school should be aware and to bring out specific recommendations for necessary modification of the child's school activities.

Health appraisals for indigent children are regarded as a community rather than a school responsibility. It is the nurse's job to see that school children from indigent families are introduced to the community health resources they need.

## Educational Activities

A statement "What Do You Believe About Health Education?" was developed by the school health department staff and instruction personnel (see p. 61). The statement was designed to crystallize a school health philosophy in Dearborn. How this philosophy is carried out varies from year to year and from school to school because of the concept of student-staff planning.

At one building, for example, students must cross a major highway to reach their play area. Despite heavy truck traffic there is no stop light. To reinforce their demand for action, students counted the number of cars and trucks passing the school—some 800 per hour. Staff, parents, and pupils worked on the problem, which was complicated by a question of which of several government units was responsible. Once this problem is solved, attention will be turned to others which can provide worthwhile learning experiences and achieve worthwhile objectives.

In other schools an inadequate breakfast at home is a perennial problem. This is something that requires home-student cooperation. Fourth grade youngsters almost traditionally tackle this problem by putting on a breakfast or luncheon in the school lunchroom for their parents (fig. 2). Usually the menu includes several choices to demonstrate different kinds of good breakfasts. A skit, written and presented by the children, dramatizes the kind of breakfasts they would like to have each day,



Figure 2. Parents join children in eating a "good" school lunch.

## Statement on School Health Education

### Do You Believe that . . .

- ▶ health education is a continuous experience in healthful living throughout the entire day?
- ▶ health education is a part of every phase of the student's experience in school and out, but improvement of living at school should be our first concern?
- ▶ health instruction should make the maximum use of the health implications inherent in all subject areas?
- ▶ health instruction should recognize personal and group problems of health and actually come to grips with the problems?
- ▶ health instruction should build upon and reinforce the health understandings, habits, and attitudes developed in preceding grades?
- ▶ the health status of students should be given consideration when determining the type of educational program in which they will participate?

- ▶ to establish effective health habits, attitudes, and practices the school must provide a healthful environment?
- ▶ health instruction is an integral part of all of the student's experiences?
- ▶ health instruction is the responsibility of every member of the total staff?
- ▶ health education should result in healthful living, and that correction of defects and mastery of health facts do not necessarily insure healthful living?
- ▶ health instruction extends beyond the course of study and the coverage of material in a basic text?
- ▶ the health program can best be evaluated in terms of behavioral changes?
- ▶ improved behavior is more certain to result when health instruction has been given through the problem-solving approach where students and staff plan and work together?

including some pointed bits of business about the conduct of adults at the breakfast table.

Other schools have tackled the first aid problem. The usual result is a first aid kit and manual written by and for each school and each room. This activity has perhaps helped as much as anything else to establish the school nurse as the school health consultant rather than a finger-wrapper.

The bicycle safety situation became a real problem in one school, especially with conflicting advice from parents and teachers about street versus sidewalk riding and left-side-of-the-street versus right. Parents, staff, and children met with a policeman and other safety experts and wrote their own bike-safety manual. This mimeographed pamphlet got the message across much more effectively than an expensively printed manual prepared by experts could have done because it was written by those who use it.

Halloween treats of candy—often sticky, unwrapped, and insanitary—got the attention of one school. The result: an attractive leaflet, written and illustrated by the children, listing the kinds of treats they would like to have.

These are but a few examples of the kinds of

health education activities in Dearborn schools. Some of them are classroom activities. Others are sponsored by health and safety committees of the student councils. All of them require planning that involves students, teachers, and the nurse and may also involve parents and representatives of community agencies.

### The Basic Text

At first the concept of health education as extending "beyond the course of study and the coverage of material in a basic text" was interpreted as the "beyond" only without "a basic text." Of late, as teachers have seen health instruction needs that remain unmet and as they have seen some of the excellent new texts available, an increasing number of requests for text books have come to the director's office.

During 1952-53, the system's elementary health curriculum committee developed screening criteria to be applied to the several health text series available. One of these criteria calls for a text that will stimulate activities of the sort described in this paper and will not substitute for them a simple reading program. Following the preliminary screening, classroom

pilot studies were made in 1953-54 to determine which series will finally be adopted for use. Carefully screened audiovisual aids and other materials are already available to teachers for enrichment of health teaching and include free materials suggested and furnished by the city health department.

In 1951 a committee was appointed to prepare an improved junior high school health and physical education curriculum. A handbook was prepared and texts selected after 2 years of work and study in which consultants from outside the system participated. Now, after 1 year of use, teachers and principals have submitted their comments on the strengths and weaknesses of the course. Their suggestions are being reviewed by the committee and recommendations for further improvement will be made.

Basically, the junior high school course involves a third of each semester devoted to health classes offered by the physical education instructor best qualified to teach health, with the remainder of the time spent in the gymnasium, pool, or on the playground. These classes include units on physical health and safety, first aid, and personality. Additional units, appropriate to the content of the course in which they are placed, are offered in "block of time" (English and social studies), general science, home-making, and industrial arts.

Work on a senior high school health curriculum has just begun as part of a systemwide overhauling of the secondary curriculum. Students have been polled informally as to their interests and needs. Courses of study from other systems have been reviewed, and a list of specific objectives is in preparation. Each high school now has an active future nurses club of which the school nurse is faculty sponsor. Some excellent health teaching is going on but on a "hit or miss" basis.

The new curriculum will emphasize preparation for family and community responsibilities. Instructional responsibility will be shared by the various departments. Teachers will work, not from a set course of study, but from a resource guide which will suggest several alternative methods and list a variety of available resources for use in achieving each objective.

## Staff Organization

The school nurse is the sparkplug of the health education and activity program within each school. The 15 nurses employed by the board of education serve 29 public schools, the junior college, and 8 parochial schools. The parochial schools are served on the same basis as the public schools, but lack the advantage of well-organized parent groups. Each nurse serves from 1,500 to 2,200 children in from 1 to 3 schools. A bachelor's degree is required for employment. The staff is remarkably stable. It has a history of only one or two resignations a year.

The successful school nurse in Dearborn shares the leadership of the health program in her school. She has active committees at work on real health problems—yet she knows better than to organize a committee just because one is suggested in the Handbook for Parent Health Workers. She has an infectious enthusiasm for her job that enables her to pile hours of work on busy principals, engineers, parents, teachers, and children and make them love it. She devotes her noon hours to informal conferences with her teachers, for her conception of a "consultant's" job is "to consult" rather than "to be consulted." She works closely with the visiting teacher and counselor, for she is conscious of the mental health implications of her work. She devotes many evenings to committee and staff meetings.

The 8 city health department nurses and their supervisor hold occasional joint meetings with the school health staff. The school and public health nurses serving the same family are encouraged to consult each other directly rather than through interdepartmental channels.

Besides the nurses, the schools employ three dental hygienists, a dentist who gives professional supervision to the fluoride program as required by law, an audiometrist, and the director.

The city health department's sanitarians make frequent inspections of the schools, with special attention to the food service and swimming pool areas. The director of school health analyzes accident reports to find correctable safety hazards.

There is no school physician. Medical advice

is provided as needed by the president of the Dearborn Medical Society, the city health officer, and the city physician.

These physicians, together with the system-wide parent health chairman and representatives of the Dearborn Dental Society, members of the board of education, teachers, principals, school administrative officers, and parochial school, school nursing, and community agencies sit on the School Health Advisory Council, which meets once a month to consider citywide school health problems.

Dearborn also has a well-organized and active community health council in which both school and city health department staffs participate.

Health and physical education policies were last revised and published in 1951. These are interpreted for the staff in the School Nursing Manual, a looseleaf publication that is under constant revision by the staff and the director. In addition, bulletins covering each phase of the systemwide program are issued each year at appropriate times through the offices of the assistant superintendents.

The school health department has a consulting and advisory, or staff, function. Line authority begins with the superintendent and extends down through the classroom teacher.

Policies are developed cooperatively by the line and staff organizations and placed in effect by the line.

For example, a parent and a nurse called the attention of the director to flaws in the system of notifying parents when cases of communicable disease occur in the classroom. The problem was discussed by the School Health Advisory Council, and a committee including a principal, nurse, parent, the city health officer, a representative of the medical society, and the director of school health drew up a recommended procedure including several form letters of an informational nature to be sent to parents. The recommendation was reviewed and approved—first, by the council; then, by the superintendent and his staff, who sent out a bulletin placing the new procedure in effect.

Under this plan of operation each group concerned has a voice in the development of policy, but the authority for implementing policy remains with the line. Much confusion is thus avoided.

The devotion of the health staff and the active cooperation of the board, the administration, parents, and teachers, rather than the pattern of operation, make it possible for Dearborn's school health program to grow and flourish.

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## Venereal Disease Postgraduate Course

The 23d venereal disease postgraduate course will be given at Tulane Medical School from January 31 through February 4, 1955, under the cosponsorship of the division of graduate medicine and the Public Health Service. The 1-week course accredited by the American Academy of General Practice covers the latest developments in diagnosis, treatment, and management of the venereal diseases and is open to all physicians. Application for enrollment should be sent to Dr. Clifford Grulee, Jr., director of the Division of Graduate Medicine, Tulane University of Louisiana, 1430 Tulane Avenue, New Orleans, La.

# research progress report

*In reporting the progress of hypertension research assisted by research grants of the Public Health Service, Dr. William H. Stewart prepared for the National Advisory Heart Council, and for limited distribution, a detailed and documented account describing these studies and their relation to the origin, process, and treatment of hypertension. This brief*

*summary of the investigations was drawn from Dr. Stewart's original report.*

*At the time of documenting the studies, Dr. Stewart was with the Grants and Training Branch, National Heart Institute. He is presently chief of the Heart Disease Control Program, Division of Special Health Services.*

## High Blood Pressure

**I**N THE PAST 5 years, approximately 2.5 million dollars from National Heart Institute appropriations has been granted for 30 research projects on high blood pressure and related fields. About 2 million dollars of this amount is employed by 21 still active projects.

The work pursued by these investigations has been a major influence in (a) encouraging additional extensive and intensive study in what was 5 years ago a peculiarly neglected field; (b) helping to bring about a change of attitude from one of near-hopelessness to one of optimism that hypertension can be managed; and (c) developing better treatment for more patients.

Investigators working on the problems of hypertension are pursuing many avenues in their research, motivated by certain general concepts. The following comments offer a crude frame into which to fit the pattern of NIH-supported research in this field as one element in the total picture.

High blood pressure, or hypertension, is the result of a disease—possibly systemic—directly affecting the blood vessels, from which the heart may ultimately suffer.

Arterial high blood pressure can be caused by or associated with a variety of disorders, but the full causes of essential hypertension, which constitutes the bulk of cases, are unknown. This type of high blood pressure is defined by

many investigators as a persistent abnormal elevation of diastolic blood pressure (the blood measure while the heart is filling) secondary to increased resistance in the peripheral vascular system—the body's bed of small and minute arterial vessels. Since it is generally believed that the abnormal elevation of diastolic blood pressure represents an effect instead of a cause, the core of the problem is the mechanism of increased peripheral resistance.

The following facts illustrate the importance of high blood pressure:

Thirteen percent of the deaths from cardiovascular disease in the United States are definitely due to high blood pressure. Many more deaths which cannot be strictly classified are attributable to hypertensive causes. An additional 30 percent of heart disease deaths cannot be accurately classified as due to arteriosclerosis or hypertension, respectively, but they are due to one of the two, or both.

Of the estimated 10 million persons with some form of cardiovascular disease, fully 4,600,000 have high blood pressure. Of the young men examined by Selective Service during the years 1940-44, 165,000 were rejected because of high blood pressure.

Hypertension is far more common in women than in men, by a ratio of about 2 to 1. On the other hand, hypertension is less frequently fatal for women.



High blood pressure causes a progressively increasing amount of disability after middle life.

The majority of the research grants projects have been aimed toward finding the process by which the peripheral resistance is increased or toward finding a means of nullifying the increased peripheral resistance as therapy for this disease. Currently, several possible processes are under investigation. The studies can be classified roughly as therapy of hypertension, experimental hypertension, and clinical hypertension.

### Therapy of Hypertension

Studies supported by the National Heart Institute on the therapy of hypertension chiefly have examined three general techniques: drugs, surgery, and diet.

An increasing variety of both new and old drugs has been under study in the past 4 or 5 years. The rapidly increasing use of some of these drugs by physicians reflects the progress of the research which found the drugs, screened and tested them, and developed their clinical use.

In view of the fact that as recently as 5 years ago there were no drugs especially satisfactory for treatment of hypertension, it is not surprising that the ideal agent has not yet been found. It is even too early to determine fully the benefits from drugs presently in use. High blood pressure is in many cases a 20-year to 25-year disease. The newer drugs, such as the Rauwolfias, have been in use less than 5 years. It can be said that many patients have been greatly helped, symptoms relieved, and useful living restored for some length of time. But a drug is not yet available which affects only the mechanism causing an elevated blood pressure, which remains effective for a long time in a given dose, and which has no bad side effects or reactions.

Surgical and dietary therapies are being improved and are continuing to be used, though perhaps not as much as in the past. At no time, however, has surgery been employed as extensively as diet therapy, which continues to be useful.

Contemporary surgical treatment consists of removal of a diseased kidney suspected of being

the cause of hypertension, removal of an endocrine tumor, correction of coarctation of the aorta, or sympathectomy. Sympathectomies—operations on the sympathetic nerves designed to reduce blood pressure—are of two types: the total sympathectomy, which aims to remove functionally as many sympathetic ganglia as feasible (those nerves adjacent to the spinal column which are linked to and control the diameter of blood vessels), and partial sympathectomy, which restricts the surgery to specific nerve areas. Each denervation differs in procedure, area, and response.

Diet therapy usually falls into 1 of 5 groups: (a) low salt diets, (b) low protein diets, (c) low cholesterol diet, (d) low caloric diet, (e) rice diet.

### Experimental Hypertension

The study of any disease is greatly facilitated if the disorder can be produced easily in experimental animals and then manipulated more or less at will. Consequently, much work is done in experimental hypertension, the production and study of this disorder in animals. This work includes studies of the factors which will modify the "experimental" disease once it has been produced and studies of its origin and development in experimental hypertension caused by kidney damage. Much attention is concentrated on the role of the sodium ion and on the activity of renin, an enzyme produced by the kidney. The sodium ion appears to have a central position in the genesis of vascular lesions.

In summary, studies have demonstrated that, by certain manipulations of the kidneys, hypertension in animals can be produced with a fair degree of predictability. Examples of such manipulation include wrapping the kidney with silk, administration of drugs or hormones, introducing infectious organisms, or substituting saturated salt solutions for drinking water. Although reports indicate considerable progress, the exact organic action of the kidney in this experimental animal hypertension is still undetermined.

Extensive investigation of the exact role of the secretions of internal glands in the production of hypertension and their relationship to



other mechanisms also have been productive of much useful knowledge, although it is not as yet decisive.

In particular, research has directed attention to secretions of the adrenal cortex and an anterior pituitary preparation. Removal of the adrenal glands had a striking effect on hypertension in nephritic rats injected with cortisone, if they were well nourished.

Grant-supported investigations of the role of nervous and psychological mechanisms in the origin and development of experimental hypertension have been directed mainly to human subjects because investigations of these stresses in experimental animals have yielded too little useful information. Even in man such studies are extremely difficult because they are affected by a multitude of variable factors. Nevertheless the few studies reported under grant support indicate that nervous and psychological factors must be considered in the complex process of hypertension.

Limited evidence indicates that persons prone to hypertension induced by nerves tend to give a positive skin reaction to injections of histamine. Such a test may help to distinguish such patients from those affected more by glandular or kidney action. Psychological tests and psychiatric interviews also may prove useful

for this purpose, in view of results obtained from a study of college women.

### Clinical Hypertension

Clinical investigations have been directed at discovering changes in function and composition of the body occurring in humans during the course of hypertension. In these studies several substances found in the blood are investigated as possible factors causing or maintaining elevations in blood pressure. Among these are:

*Serotonin.* A material normally found in the blood and taking part in the mechanism of blood clotting, but also a powerful constrictor of blood vessels.

*Pherentasin.* A highly active constrictor substance rarely present in the blood of mammals but isolated in the blood of hypertensive patients.

*VEM (vasoexcitor material).* A substance produced by the kidney to maintain blood pressure during shock.

*Corticotrophin (ACTH) and cortisone.* Hormones produced by special glands of the body that help regulate body function.

*Epinephrine and nor-epinephrine.* Hormones produced by the adrenal glands that act in controlling heart rate and blood vessel tone.

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## Dr. Hugh Rodman Leavell

Hugh Rodman Leavell, M.D., Dr.P.H., was chosen president-elect of the National Health Council by its board of directors in December 1954. He takes the place of T. Duckett Jones, M.D., who died on November 22, 1954.

Dr. Leavell, recently the president of the American Public Health Association, has been professor and head of the department of public health practice of the Harvard School of Public Health since 1946. He will succeed to the presidency of the council at its annual meeting in March 1955.

*The membrane filter technique described holds promise for the more extensive use of enterococci as indicators of the sanitary quality of water and other materials.*

# Use of the Membrane Filter Technique To Enumerate Enterococci in Water

By L. W. SLANETZ, Ph.D., D. F. BENT, M.S., and CLARA H. BARTLEY, Ph.D.

ALTHOUGH tests for coliform organisms are still generally used to determine the sanitary quality of water, there continues to be much interest in the use of enterococci as indicators of fecal pollution. Considerable evidence is available to show that the presence of enterococci in water or in other materials may more accurately indicate fecal contamination than the presence of coliforms since it is difficult to establish the fecal origin of the latter organisms. A number of investigators have shown that the enterococci are present in feces, sewage, and polluted water and that they are not found in water, soil, or other materials free from human or animal contacts or contamination.

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*Dr. Slanetz is professor of bacteriology and chairman, department of bacteriology, University of New Hampshire. Mr. Bent and Dr. Bartley have been associated with Dr. Slanetz, Dr. Bartley as assistant professor of bacteriology, and Mr. Bent as a graduate assistant at the university. Mr. Bent is now at the University of Maryland, as a graduate assistant in the department of bacteriology.*

*This paper was presented in part at the 54th general meeting of the Society of American Bacteriologists, May 2-7, 1954, in Pittsburgh.*

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As early as 1900, Houston (1) demonstrated that streptococci are present in polluted waters and appeared to be absent in nonpolluted samples.

When Mallmann and Sypien (2) in 1934 compared the coliform and streptococcus indexes of samples of water taken 5 feet from the shore of a bathing beach, they found that while the coliform indexes and total plate counts did not always respond to changes in bathing loads, the streptococcus indexes did. The streptococci were not found at points free from bathing pollution although the coliform organisms were present in such areas.

Winter and Sandholzer (3) also reported that coliform organisms persisted for a great distance from the source of pollution in water, but that the streptococci did not. They found that although streptococci were present in all samples of human and animal feces tested, these organisms were never found in virgin soils or in soils from wooded areas.

Ostrolenk and Hunter (4) demonstrated that in 37 percent of 51 fecal specimens which they examined, enterococci occurred in equal or greater numbers than did *Escherichia coli*. In the remaining 63 percent of the specimens, *E. coli* exceeded enterococci numerically by from 1 to 5 decimal dilutions. These investigators suggested that the lower number of enterococci in

human and animal feces does not necessarily minimize the potential sanitary significance of fecal streptococci.

Mallmann and Litsky (5), using a dextrose azide broth, were unable to isolate enterococci from soils which were not treated with sewage or animal manure. Although the coliforms were found to persist in sewage-treated soil, the enterococci were found to die out rapidly but not as rapidly as virulent typhoid bacilli.

The lack of suitable methods and media for the detection and estimation of the numbers of enterococci in water or other substances has been one of the chief problems in the use of these bacteria as indicators of fecal pollution. This situation may also account for variations in results reported in the estimation of numbers of these organisms in fecal specimens or in water.

In recent years, much progress has been made in the improvement of techniques for the cultivation of these organisms from various materials. Important contributions have been made by Mallmann (6), Winter and Sandholzer (3), and others (7-11). Because many of these papers have been reviewed briefly by Litsky, Mallmann and Fifield (11), they will not be discussed here.

Mallmann and Seligmann (10) compared standard lactose broth, sodium azide broth (Mallmann), Hajna and Perry S.F. (*Streptococcus faecalis*) broth (Difco), and Rothe azide dextrose broth (Difco) as media for the detection of streptococci in water and sewage. Mallmann and Seligmann noted that the Rothe azide dextrose broth gave the best results for the quantitative determination of streptococci. However, the tubes had to be checked microscopically since gram-positive bacilli might be responsible for turbidity in the cultures. They suggested that azide dextrose broth be used as a new means for testing and measuring streptococci in water, sewage, and shellfish, or in other materials suspected of sewage pollution.

Litsky, Mallmann, and Fifield (11) attempted to develop a confirmatory medium so that an enterococcus index could be obtained in a manner similar to that used for coliforms by the present standard methods procedures for water analysis. These investigators were able

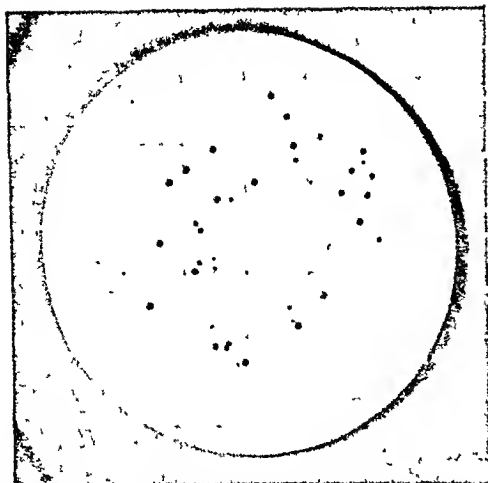
to prepare a medium containing ethyl violet and sodium azide, a medium which they found highly selective and specific for the growth of enterococci. They proposed a new test for enterococci which would use the dextrose azide broth as a presumptive medium and the ethyl violet azide broth as a confirmatory medium. The dextrose azide and ethyl violet broth procedure detected and confirmed 100 to 1,000 times as many enterococci as did the Hajna-Perry S.F. method and the Winter-Sandholzer procedures.

In the present study, our interest was in determining whether, by using the membrane filter technique, methods and media could be developed for the detection and enumeration of enterococci in water. Efficient filter techniques for detecting coliforms in water had been reported by Clark and associates (12), Goetz and Tsuneishi (13), Kabler (14), and others, and there is also a report now in press (15). Thus, it was thought that similar procedures might prove valuable for determination of enterococci.

## Materials and Methods

Two types of membrane filter—Millipore (A) and Bac-T-Flex (B)—and the apparatus supplied for both types were used in these studies. The filters were sterilized by placing them between S&S absorbent pads (B), wrapping them in desired numbers in kraft or some other type of wrapping paper, and autoclaving at 121° C., at 15 pounds pressure, for 10 minutes. Then the steam pressure was reduced rapidly to prevent condensation of water on the membranes. When ready for use, the filters and pads were handled by placing them in sterile petri dishes. The filter apparatus was sterilized by autoclaving at 121° C. for 10 minutes also.

For the selective cultivation of enterococci, various media and inhibitory substances were tested for use with the membrane filters. These included: the Hajna-Perry S.F. broth; the Rothe azide dextrose broth; the Winter-Sandholzer sodium azide presumptive broth; the Chapman mitis-salivarius medium; the confirmatory broth of Litsky, Mallmann, and Fifield; and modifications of all these media. Each medium was also tested after the concentration of the nutrient materials was doubled.



Colonies of enterococci on a Bac-T-Flex filter. This picture has not been magnified. One hundred milliliters of polluted river water was filtered through this membrane before it was incubated on pads with the selective enterococcus medium.

To color the colonies of enterococci, 0.01 percent 2,3,5 triphenyl tetrazolium chloride (TTC) was added to the media. A stock solution of 1 percent of the TTC was prepared and sterilized at 121° C. for 15 minutes. Then just before use it was added aseptically in the required amounts to the broth media.

The filtration and cultivation procedures used during these studies were similar to those outlined for determination of coliform bacteria in water (12-15). The various culture media tested were added in 2.2-milliliter amounts to the absorbent pads. The desired amount of water sample or culture material was filtered through the membrane filters using a vacuum produced by a filter pump on water pressure. The filters were then transferred directly to pads containing the test media. These cultures were placed on a shelf about 1 inch above the water level in a covered water bath and incubated at 35° to 37° C. for 48 hours. After incubation was completed, colony counts were made using a stereoscopic microscope magnifying 10 times.

#### Cultivation of Enterococci on Filters

To determine the efficiency of various media for the cultivation of enterococci on the membrane filters, both dilute suspensions of *Streptococcus faecalis* and samples of polluted water

were employed. Of the different media listed in the preceding section on "Materials and Methods," a modification of the Chapman mitis-salivarius medium proved to be most satisfactory for the cultivation of enterococci on the filters. This modified medium was prepared as follows:

	Percent composition
Tryptone -----	2.0
Proteose peptone No. 3 (Difco) -----	1.0
Proteose peptone (Difco) -----	1.0
Glucose -----	.2
Sucrose -----	10.0
Dipotassium phosphate -----	.4
Sodium azide -----	.04

Final pH 7.0-7.2.

Sterilize at 121° C. for 15 minutes.

Prepare a 1-percent 2,3,5 triphenyl tetrazolium chloride (TTC) solution, sterilize, and add aseptically to above medium just before use to give 0.01 percent final concentration.

After preparation, the base medium was used within a 1-week period.

When this medium is used, the enterococci develop on the filters either as flat colonies, which are light pink in color, or as raised, glistening colonies which are dark red with a pink periphery. At the end of 48 hours' incubation of the cultures at 35° to 37° C., the colonies ranged in size from 0.5 to 2 millimeters in diameter. Although colonies could be detected after the cultures had been incubated for 24 hours, better growth was obtained when the incubation period was 48 hours.

On tests made with polluted river water, colorless colonies of gram-positive bacilli have occasionally developed on the filters. Preliminary tests have indicated that these organisms could be inhibited by the addition of 0.000012 percent ethyl violet to the medium, although concentrations of 0.00012 percent of the dye did not appear to inhibit the growth of the enterococci. However, since the gram-positive bacilli have appeared so rarely on tests made to date, ethyl violet has not been added routinely to our enterococcus medium. We have recently found that 4 percent tryptone and 1 percent yeast extract can be substituted for the proportions of tryptone, proteose peptone No. 3, and proteose peptone used.

When our medium was used in tests with pure cultures of *S. faecalis*, the colony counts on the filters were comparable to those obtained on tryptose glucose agar plates. As well as supporting good growth of enterococci, this medium proved to be highly selective and efficient for the cultivation of enterococci from contaminated water. Potassium tellurite and merthiolate were not suitable as selective agents since they also inhibit growth of the enterococci.

#### Efficiency for Enterococcus Counts

The efficiency of the membrane filter for the determination of numbers of enterococci in water, as used with our enterococcus medium, was compared with other procedures, particularly with the most probable number (MPN) methods described by Winter and Sandholzer (3) and by Litsky and his associates (11). Tests were made on water samples taken from

**Table 1. Comparison of numbers of enterococci in water samples by membrane filter and Winter-Sandholzer techniques, and data on coliform densities**

Sample No.	Enterococci		Coliforms	
	Filter technique	Winter-Sandholzer MPN technique	Filter technique	Standard 5-tube MPN technique
1-----	11	2	100	350
2-----	16	0	450	540
3-----	320	6.8	160	110
4-----	224	4.5	50	110
5-----	61	0	80	130
6-----	121	49	530	920
7-----	182	110	640	920
8-----	48	49	1,520	1,600
9-----	146	130	150	350

NOTE: Numbers indicate enterococci or coliforms per 100 ml. of water and represent an average of counts on duplicate Bac-T-Flex filters.

a reservoir and six different rivers. The coliform density for these samples was also determined by the standard methods MPN and by membrane filter techniques, which are similar to those outlined by Kabler (14) and are described in a paper now in press (15). Examples of the results obtained with the comparative filter and MPN techniques for coliform density and

the enumeration of enterococci are recorded in tables 1 and 2.

The membrane filter technique always gave higher counts for enterococci than did the Winter-Sandholzer method and gave higher counts than the procedures of Litsky and as-

**Table 2. Comparison of numbers of enterococci in water samples, by membrane filter and Litsky-Mallmann-Fifield techniques, and data on coliform densities**

Sample No.	Enterococci		Coliforms	
	Filter technique	Litsky-Mallmann-Fifield MPN technique	Filter technique	Standard 5-tube MPN technique
1-----	4	0	140	220
2-----	2	2	690	1,600
3-----	6	0	350	145
4-----	48	0	480	1,600
5-----	48	0	430	350
6-----	98	79	100	130
7-----	0	0	30	23
8-----	6	2	500	145
9-----	5	2	184	170
10-----	242	220	360	920
11-----	27	0	680	920
12-----	205	170	1,530	1,600
13-----	433	240	1,560	1,600
14-----	129	9.4	1,060	920
15-----	508	350	320	540
16-----	594	920	290	540
17-----	1,196	1,600	200	540
18-----	284	350	80	33

NOTE: Numbers indicate enterococci or coliforms per 100 ml. of water and represent an average of counts on duplicate Bac-T-Flex filters.

sociates for all but three of the samples listed. Thus, when it was used in conjunction with the membrane filters, our selective medium proved highly efficient for the detection and enumeration of enterococci in the water samples. The colonies of enterococci were pink to red in color, and practically all other types of bacteria were inhibited even when 100 milliliters of highly polluted water was filtered through the membranes (see the photograph).

During the study, more than 300 of these pink and red colonies were isolated from the membranes used for the tests on water samples reported in tables 1 and 2. These colonies were first inoculated into the confirmatory ethyl violet azide broth of Litsky, Mallmann, and

Fifield, and then further tested for their ability to grow in 0.1 percent methylene blue milk; in a glucose broth containing 6.5 percent sodium chloride; in a glucose broth adjusted to pH 9.6; and at a temperature of 45° C. All but six of the cultures so tested were identified as enterococci. These six cultures were isolated from red pinpoint colonies which were atypical and rough in appearance. For some of the water samples tested, all of the pink or red colonies which developed on a particular filter were cultured as outlined previously, and all proved to be enterococci.

In addition to its efficiency, the procedure, when compared with other techniques previously developed for the detection of these organisms, saves considerable time, labor, and materials.

Although the counts for enterococci were comparable on both types of membrane filters, the colonies could be counted more easily on the filters with the 8-mm.-square grid markings (B) than on those with the 3-mm.-square grid (A). Because the former filter is also the more flexible and durable of the two types, it was used for the majority of tests reported here. Also, the apparatus supplied by its manufacturer had the advantage of providing a larger filtration area on the surface of the membranes.

Although the numbers of coliforms were generally greater than the numbers of enterococci in the water samples tested, enterococci were detected in all samples containing coliforms except one. This was a sample of river water which had a low coliform index. The coliforms as determined by the filter and the standard methods MPN procedures were in good agreement. Further studies are necessary to establish the significance of the numbers of enterococci as compared with the significance of the numbers of coliform bacteria in the determination of the sanitary quality of water. However, it would appear that the medium and filter technique described in this paper provide a relatively simple and efficient method for the quantitative determination of enterococci in water or other materials. By use of this procedure, tests for these bacteria may thus prove to be more reliable for establishing the sanitary quality of water and foods than have tests for coliform organisms.

## Summary

A highly selective and efficient medium has been developed for use with membrane filters in the detection of enterococci in water. With this membrane filter technique, the counts for enterococci were generally higher than those obtained by other procedures. The method affords a relatively simple and direct means for the determination of the numbers of enterococci in water or in other materials.

## EQUIPMENT REFERENCES

- (A) Millipore filters (3-mm.-square grid markings) and apparatus. Supplied by Lovell Chemical Company, Watertown, Mass.
- (B) Bac-T-Flex filters (8-mm.-square grid markings), Coli 5 apparatus, and S&S absorbent pads No. 470. Supplied by Carl Schleicher & Schuell Co., Keene, N. H.

## REFERENCES

- (1) Houston, A. C.: On the value of examination of water for streptococci and staphylococci with a view to detection of its recent contamination with animal organic matter. Supp. to the 29th annual report of the local government board containing the report of the Medical Officer for 1899-1900. London, London County Council, 1900, p. 458.
- (2) Mallmann, W. L., and Syplen, A.: Pollution indices of natural bathing places. *Am. J. Pub. Health* 24: 681 (1934).
- (3) Winter, C. E., and Sandholzer, L. A.: Studies of fecal streptococci. I. The isolation of streptococci from natural sources. U. S. Fish and Wildlife Service. Fish Leaflet 201. Washington, D. C., U. S. Government Printing Office, 1946.
- (4) Ostrolenk, M., and Hunter, A. C.: The distribution of enteric streptococci. *J. Bact.* 51: 735-741 (1946).
- (5) Mallmann, W. L., and Litsky, W.: Survival of selected enteric organisms in various types of soil. *Am. J. Pub. Health* 41: 38 (1951).
- (6) Mallmann, W. L.: A new yardstick for measuring sewage pollution. *Sewage Works J.* 12: 875 (1940).
- (7) Fleming, A.: On the specific antibacterial properties of penicillin and potassium tellurite. *J. Path. & Bact.* 35: 831 (1932).
- (8) Hajna, A. A., and Perry, C. A.: Comparative study of presumptive and confirmatory media for bacteria of the coliform group and fecal streptococci. *Am. J. Pub. Health* 33: 550 (1943).
- (9) Chapman, G. H.: The isolation and testing of

fecal streptococci. *Am. J. Digest. Dis.* 13: 105 (1946).

- (10) Mallmann, W. L., and Seligmann, E. B., Jr.: A comparative study of media for the detection of streptococci in water and sewage. *Am. J. Pub. Health* 40: 286-289 (1950).
- (11) Litsky, W., Mallmann, W. L., and Fifield, C. W.: A new medium for the detection of enterococci in water. *Am. J. Pub. Health* 43: 873-879 (1953).
- (12) Clark, H. F., Geldreich, E. E., Jeter, H. L., and Kabler, P. W.: The membrane filter in sanitary

baeteriology. *Pub. Health Rep.* 66: 951-977 (1951).

- (13) Goetz, A., and Tsuneishi, N.: Application of molecular filter membranes to the bacteriological analysis of water. *J. Am. Water Works Assoc.* 43: 943 (1951).
- (14) Kabler, P. W.: Water examinations by membrane filter and most probable number procedures. *Am. J. Pub. Health* 44: 379 (1954).
- (15) Slanetz, L. W., and Bartley, C. H.: Evaluation of membrane filters for the determination of numbers of coliform bacteria in water. To be published in *Applied Microbiology*.

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## East Coast Migrant Conference Report

Leaders from 10 east coast States and representatives of public and private groups working directly with migrant families met in Washington, D. C., during May 17-19, 1954, to work out steps that will lead to better health, schooling, and security for the children of migrants—and, to some degree, for their families. The movement of seasonal farm workers has long created problems, both for the migrants and for the communities where they live temporarily.

Conference participants explored many areas in which they thought action was needed. Health questions were concentrated on such subjects as health records, environmental sanitation and housing, and financing of health services. In the short time available, the conferees sketched out a general guide for action and for further exploration. Their ideas and specific proposals, together with individual reports from the States taking part, are contained in a 110-page report which is available upon request to Paul Blackwood, Room 3280, Department of Health, Education, and Welfare, Washington 25, D. C.

The conference was sponsored by agencies of the Department of Health, Education, and Welfare—the Public Health Service, the Children's Bureau, the Office of Education, and the Bureau of Public Assistance. The States represented were Delaware, Florida, Georgia, Maryland, New Jersey, New York, North Carolina, Pennsylvania, South Carolina, and Virginia.

## The Commissioned Reserve In Defense and Disaster Health Services

THE DEVELOPMENT of health emergency services in the present era for a population as large and as widespread as that of the United States is one of the most urgent current problems before the health professions. Our experience in prior war periods, although helpful in some respects, has not prepared us realistically for meeting civil defense needs of the future. In fact, had not the superb military defense of our armed forces and those of our allies kept the enemy from our shores, the American people would have paid dearly in needless death and illness because of inadequate civil defense preparation. Today, the situation is vastly more dangerous; the hour is late for orienting our total health forces to the task.

Perhaps the most important and most difficult of the Public Health Service's new national defense responsibilities is the development of an adequate Commissioned Reserve Corps. Since World War II, the Service has been most anxious about the development and maintenance of a reserve commensurate with our existing and potential responsibilities. Although we have had statutory authority for a reserve since 1918, we have never been able to use the mechanism to its greatest advantage.

Our World War II experience proved that to be effective a commissioned reserve should be recruited in peacetime and adequately trained for call to duty in emergencies. The Service had to rely on hastily recruited and superficially trained reserve officers to help

State and Territorial health departments meet their needs for personnel in war areas. We also had to recruit and activate almost overnight many thousands of reserve officers for duty in the Office of Civilian Defense, the United States Coast Guard, the War Maritime Administration, the United Nations Relief and Rehabilitation Administration, and many other war organizations.

In any defense emergency, the total mission of the Public Health Service requires a strong reserve for a variety of activities. In the future, we can readily visualize a greater variety and a larger number of demands than we have known in the past. For this reason, we look upon our present responsibility to the Federal Civil Defense Administration as a long-awaited opportunity to begin the development of a Commissioned Reserve Corps in an orderly fashion—in a preventive fashion, if you will. We intend to combine our commissioning of reserves for civil defense with commissioning for our essential functions in war or other emergency.

The Public Health Service now seeks two primary objectives: first, to augment the supply of health personnel who will be available across the country; and, second, to assure their mobility. Mobility in a national emergency, such as enemy attack, obviously calls for commissioned personnel with credentials which can command transportation and admission through military lines.

Our aim is to augment—not to deplete—the available supply of personnel for duty in public health activities. We will work out with State and Territorial health officers plans for the most effective training and utilization of existing public health personnel through the Commissioned Reserve Corps. At the same time we will recruit actively outside State and local public health staffs. There are many valuable sources which have not been tapped. We have in mind the professional staffs of voluntary health agencies, universities, industrial health and safety services, and insurance companies,

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*Statement by the Surgeon General based on his annual message to the State and Territorial health officers, Washington, D. C., December 7, 1954.*

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for example, as well as competent individuals from the appropriate professional and technical groups.

The purpose of the entire program is to provide the organization, training, and mechanisms that will enable members of the health professions to serve to the best possible advantage in civilian services during a national crisis. We will use every available resource to train reserve officers in the health problems associated with atomic, biological, and chemical warfare, as well as in other emergency health problems.

We do not expect to call an officer in the emergency reserve to active duty without his consent, except in the face of a clear and present danger publicly recognized. Such an officer perform-

ing important health duties would not be moved to another area unless the situation clearly justified such a shift. Of course, members of the commissioned reserve may request active duty at any time.

It is to the self-interest of every State, Territorial, and local health officer to promote the development of the Public Health Service Commissioned Reserve, and the wholehearted cooperation of each health officer is strongly recommended in this important Public Health Service activity. Remember, the civil defense objective of the program is to provide indispensable health personnel for the protection of the people in each area should bombs fall or biological attack occur.

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## PHS Medical Research Grants

Surgeon General Leonard A. Scheele of the Public Health Service has announced approval of 972 grants for basic and applied research in many of today's major diseases. The awards, recommended and approved by the National Advisory Council, are administered by the National Institutes of Health. They were made in December 1954 to scientists in approximately 215 research institutions of the United States. More than half of the awards were for continuation of existing medical research projects.

The grants award program of the Public Health Service covers support of research in the medical and biological sciences, particularly heart disease, cancer, mental illness, arthritis and metabolic diseases, the neurological and sensory disorders, diseases of the teeth and mouth, and certain diseases of microbiological and parasitic origin. Other research projects supported by the program are concerned with the fundamental exploration of metabolic and biological phenomena underlying the causes of most of the prevailing noninfectious diseases.

A full or partial listing of the individual grants, broken down by investigator, project title, amount of support, and research institution is available from the Scientific Reports Branch, National Institutes of Health, Public Health Service, Bethesda 14, Md.

# Evaluating Short Health Training Courses Through Content Analysis

By ALLEN D. SPIEGEL, M.P.H., THEODORE I. BLEEKER, M.A., and  
SHIRLEY G. BORTOLUZZI, B.S.

THE ADDITION of content analysis to the armamentarium of the health educator provides a valuable tool for evaluating such programs as workshops, institutes, buzz sessions, and seminars. Content analysis can be applied to situations in which the participants freely express their critical opinions of the program without resorting to the use of a detailed evaluation form. The increasing popularity of short programs opens the way for content analysis which more easily measures opinions, attitudes, and feelings that are expressed spontaneously in a written comment. A content analysis reveals information not ordinarily determined by highly structured testing and opinion research methods.

Content analysis has been defined as "... a research technique for the objective, systematic, and quantitative description of the manifest content of communication" (1).

A study conducted by the bureau of public health education, New York City Department of Health, is, we believe, a unique example of

the application of content analysis to an inservice training program for dental hygienists. This report demonstrates how the method is applied and evaluates its use in this type of program. No attempt was made to gain evidence of changes in attitudes or behavior. The analysis was made to determine reactions to the training program.

## The Dental Hygienist Training Program

An inservice training program for dental hygienists was planned by the bureau of public health education in consultation with the bureau of public health dentistry. The director of the bureau of public health dentistry requested that the training program have a direct relationship to the work of the dental hygienists and that each hygienist be given a feeling of active participation in the program.

Accordingly, as soon as preliminary outlines for the program were completed, a questionnaire requesting preferences as to subject was sent to all the dental hygienists. The questionnaire was developed by a health educator who had been a dental hygienist and who had knowledge of the group's problems.

One hundred four question sheets out of a possible 138 were returned. The subjects to be included in the group and in the panel discussions were decided on the basis of the returned questionnaires.

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Three days were allocated to the inservice program held at a conveniently located health center. At the first session the chairman explained the objectives of the program. The choice of discussion groups in which members might participate on the second day of the institute was explained. Each hygienist was asked to write her first three choices of subject for each session. No one was put into a group not listed as one of her choices. This met the needs of the individual hygienist and provided a feeling of participation.

The afternoon session of the first day consisted of a panel discussion by various professionals of the many factors of a public health dental program. Time was allotted for a question and answer period.

The second day of the program was concerned with work problems. The morning was devoted to a "how-to-do-it" session and the afternoon, to a "talking-it-over" session. How-to-do-it sessions were concerned with teaching skills needed to perform job activities. In these groups, the leaders did some direct teaching, but many opportunities were allowed for the hygienist to participate, share experiences and problems, and find solutions.

Talking-it-over sessions were entirely of a group participation nature. The moderator served as a guide while the participants presented problems and reached solutions.

Each how-to-do-it session was serviced by a combination moderator-resource person, an observer, and a recorder. Each talking-it-over group had a moderator, a resource person, an observer, and a recorder. The recorders were dental hygienists from the groups. The others were public health educators, dentists, nurses, nutritionists, teachers, and social workers.

The "feed-back" sessions on the third day were devoted to discussing the written reports of the recorders. These reports were read aloud for the benefit of the entire group.

The inservice training program for dental hygienists was designed to:

1. Provide the latest professional information for the staff of dental hygienists.
2. Maintain the high professional standards of the staff.
3. Assist the dental hygienists to acquire the educational and professional knowledge and

skill to help them promote, organize, and operate better dental health education programs.

4. Help the dental hygienists acquire an insight into problems arising from interpersonal relationships between lay and professional persons encountered in the course of daily routine.

5. Stimulate discussion, participation, and resolution of problems by the dental hygienists through the group process in the inservice training program itself.

The first two objectives were the only original goals set up by the planning committee and were considered to be long range and continuing. The evaluation committee concluded that the implied aims of the two objectives should be included in a statement of objectives of the program. Therefore, the others were added to the two long-range goals before any evaluation was attempted.

### The Method of Analysis

To evaluate the inservice training program, it was not feasible to employ questionnaires for determining preprogram and postprogram skills and attitudes. Nor were statistical methods involving control groups applicable. From the nature of the materials available, it appeared useful to attempt the content analysis technique.

The written reactions of the dental hygienists to each of the 10 group discussions constituted material to be subjected to content analysis. These anonymous comments presented an important opportunity for the evaluation of the degree to which the objectives of the program were attained. Reports of recorders and observers were also used in the evaluation.

Because of the large number of statements, a technique was required to organize the comments according to their relationships to the objectives of the program. Therefore, the immediate aims of the program were reviewed, and categories were determined for each of the goals. These categories represented separate pigeonholes into which each of the statements of the hygienists would be cast for qualitative and numerical examination.

To avoid bias in the analysis, all statements must have a category wherein they may rest easily. Four categories were set up with each

category representing one of the objectives (table 1).

To maintain the objectivity of the analysis and to minimize personal bias, several methods were used. First, indicators were agreed upon for each category. The indicators served as guides to determine the category for each reaction (table 2).

As a second method of maintaining objectivity, every reaction of the dental hygienists was placed in a category separately by each researcher and then recoded at a conference of all three researchers. Thus, 350 statements were categorized, with each of the 10 sessions' reactions kept separate. In some instances there was only one statement on a card to be coded. In other cases there were many statements on the reaction card.

**Table 1. Relations between objectives and content analysis categories**

Objective	Category
Implementation of classroom skills and knowledge.	{Statements referring to educational and professional knowledge and skills.
Improvement of group leader methods.	{Statements referring to group leader methods.
Discussion of interpersonal relations and participation in the group process	{Statements referring to group participation and feeling.

NOTE. A fourth category was drawn up to encompass statements of a nonspecific critical nature.

By comparing the quality and quantity of statements relating to a particular objective, one has an easily manageable and more significant evaluative measure than would be possible with any other technique which must handle many freely expressed comments.

### Analysis

In analyzing the comments of the 166 hygienists given during the 10 sessions (table 3), every effort was made not to change actual quotations of participants in assigning statements to the appropriate category.

Comments presented during two sessions, "how to speak at an assembly meeting" and "clinic dentist," are given in detail. The num-

**Table 2. Categories and indicators**

Category	Indicator
Educational and professional.	{Specific items of technique and of knowledge.
Group leader methods.	{Authoritarianism, permissiveness, teaching aids, and techniques.
Group participation and feeling.	{Group consensus, sense of identification and participation.
Critical statements-----	{Items of a nonspecific and specific critical nature.

bers in parentheses after statements indicate how many times the statement was repeated.

### *How To Speak at an Assembly Meeting*

*Knowledge and skills.* There were five statements noting the recognition of general knowledge and skills as signified by the statement, "many new ideas." In addition, there were six separate statements referring to specific knowledge or a skill, such as, "motivate children."

Typical comments were: many new ideas on speaking to group (5); ideas on school cooperation (1); know your objective (2); know your audience (2); and motivate children (1).

*Group leadership methods.* There were three statements recognizing the positive contributions of the leader to the discussion. In opposition were two statements which reflected unfavorably upon the leader's ability.

Observers' statements which supported the favorable reactions were: At no time did the moderator allow time to be consumed by irrelevant remarks; the group never went off on tangents; and the moderator handled the group very skillfully in order to include all members in the discussion.

Reactions were: leader's instruction especially valuable (2); problem area fully covered (1); not enough time to go over mechanics of speaking (1); and problem led us afield of how to do it (1).

*Group participation and feeling.* All dental hygienist reactions showed cognizance of the group process, including active participation of members, recognition and solution of problems, and the benefits of interpersonal relationships. The group tone was favorable.

Supporting the favorable comments on group tone, the observer noted: The group as a whole

**Table 3. Number of dental hygienists and frequency distribution of their comments according to category by session**

Session	Num-ber in group	Categories							Total com-ments
		Knowl-edge and skills	Group leadership methods		Group participation and feeling		Critical statements		
			Fa-vor-able	Unfa-vor-able	Fa-vor-able	Unfa-vor-able	Fa-vor-able	Unfa-vor-able	
Classroom discussion.....	16	5	5	1	5	0	4	0	20
Assembly meeting.....	12	11	3	2	6	0	14	0	36
Parents meeting.....	15	10	0	8	6	1	6	3	34
Audiovisual.....	21	16	3	2	6	2	18	0	47
Tooth brushing.....	15	14	4	0	11	0	16	13	58
How-to-do-it total.....	79	56	15 13 28		34 3 37		58 16 74		195
Child in clinic.....	14	4	0	1	5	0	3	1	14
Parent interview.....	20	2	1	0	18	0	20	0	41
Home visit.....	23	7	0	0	1	0	6	6	20
Clinic dentist.....	15	11	1	1	9	2	14	6	44
Nursing staff.....	15	8	0	9	5	4	5	5	36
Talking-it-over total.....	87	32	2 11 13		38 6 44		48 18 66		155
Grand total.....	166	88	41		81		140		350

and the members individually showed amazing enthusiasm and interest.

The comments were: many good suggestions and ideas brought to surface (2); served as catharsis—getting it off chest (1); group has covered problems and solutions quite well (1); benefited from experiences of group (1); and discussion very stimulating (1).

*Critical statements.* There are 14 subjective statements reflecting general approval of the session, the workshop process, and the personal benefits gained.

Observer commented that the group felt reasonably adequate solutions were arrived at but that there was not enough time for full discussion.

The hygienists said: enjoyed discussion very much (3); learned great deal from it (3); thought it was profitable (2); workshop idea excellent (3); gotten many good ideas and answers to questions troubling me (2); and it was fine and hope I can follow through (1).

#### *Clinic Dentist*

The coded comments of the hygienists participating in a talk-it-over session, "clinic dentist,"

are given for comparison with the above comments from the how-to-do-it session.

*Knowledge and skills.* Eight statements acknowledged the importance of developing good interpersonal relationships among clinic personnel and the necessity for critical examination of attitudes. Three other statements commented on general and specific techniques of cooperation.

The observer's report reinforced and elaborated the hygienists' statements expanding on the knowledge and skills that were discussed.

*Hygienists commented:* a matter of personalities and learning to get along (2); relationship between dentist and hygienist should be based on mutual understanding (2); cooperation makes more harmonious relations in clinic (2); develop a closer feeling toward work and co-workers (1); share duties (1); have no specific duties (1); gained information which will help to keep clinic (1); and able to learn from other's problems (1).

*Group leader methods.* Two comments of a contradictory nature were present: one favorable in a general sense, the other critical, showing a specific fault.

Observer noted that the moderator was skillful in resolving initial resistance. Further, the observer commented that the moderator kept the group on the subject.

Remarks were: too much straying from subject and moderator helpful.

*Group participation and feeling.* Nine statements mirrored feeling on the value of exchange of ideas, the sense of working together to resolve problems, the opportunities to share experiences, and the value of group discussion. Two dissenting comments noted that the topic was not suitable for group discussion and that the group should have been more homogeneous.

Observer noted that no one was prevented from introducing pertinent subject matter. The observer also noted that participation may have been restricted because of the presence of two dentists and a resource person.

The stated reactions were: problems common to most (2); opportunities for airing personal likes and dislikes (2); discussion group a fine way of learning (1); nice to get together to discuss problems (1); group discussion improves feeling toward work (1); exchanged solutions to personal problems (1); makes us feel we are working together (1); accomplish more with smaller group (1); and topic should not be discussed in groups (1).

*Critical statements.* The expressions affirmed the value of this type of session. Two further statements continued this theme by requesting more sessions of this type. Six comments of a negative nature regarded the session as having no value. Four of these felt it was the fault of the type of session and two felt the discussion was not useful personally. Two statements echoed the suggestion that clinic dentists should be present to air opinions.

Observer commented that the session had definite value even though solutions were difficult to achieve. The observer also remarked upon the anxiety of the group to continue similar discussions.

The comments were: dentists should be there to air opinion (2); discussion helpful (2); interesting and informative (7); sessions valuable to work (1); should have more sessions (2); can hardly solve problems (4); and not valuable to me personally (2).

The remainder of the groups were treated in the manner previously explained and illus-

trated. Following is a summation of the results of the overall sessions.

## Summary

This summation is based on the method of content analysis as applied not only to individual sessions, but also to the program as a whole. Each category summarization represents a compilation of all comments from all 10 sessions in that category.

### *Knowledge and Skills*

Eighty-eight comments were elicited from all sessions covering specific items of knowledge and skill with a low of 2 for the "parent interview" and a high of 16 for "audiovisual aids."

In this category of knowledge and skills, the effectiveness of imparting the information has to be judged on two bases: the quality and quantity of the dental hygienists' comments and the supporting comments in this category by the observer and recorder. Quality refers to the degree of specificity of the comment. Those comments which referred to knowledge and skills in a nonspecific way were put in the category of critical statements. Content analysis alone did not seem to be sufficient for judging knowledge and skills acquired in this program.

Content analysis, however, does prove of benefit in numerically ascertaining comparisons of types of responses. More responses in knowledge and skills were made in the how-to-do-it session than in the talking-it-over session. This would seem to reflect the nature of the sessions.

### *Group Leader Methods*

Content analysis proved most valuable in showing which staff members needed further training in group leadership. For example, in the session of "parent's meeting" there were eight unfavorable comments and none favorable. The nature of the comments indicated that this particular group leader probably needed training in motivational techniques and lesson planning.

The talking-it-over session produced a few comments on group leader methods. This is as it should be, since the session was designed to mute the leader's role and to encourage

democratic group participation. One session, produced nine unfavorable comments in this category. In reviewing the critical statements of this group, they showed that the leader lost direction of the group and did not fulfill the role of moderator. This leader should receive special training in group guidance.

Content analysis will help in the organization of future programs by determining which staff member should participate and which skills should be emphasized in their orientation training.

### *Group Participation and Feeling*

Examination of the data for this category reveals a preponderance of favorable remarks relating to the group process. Significantly, even though group participation was new to many of the participants and therefore not many remarks could be anticipated in this category, the 81 comments showed that the dental hygienists recognized and commented on many aspects of the group process. These comments noted the various phases of group interaction, such as exchange of ideas, recognition of problems, solution of problems through discussion methods, and the good interpersonal relationships developed through this medium.

Content analysis would seem to be an effective tool for determining the intangibles of the group process which would be difficult if not impossible to ascertain using objective measuring devices.

### *Critical Statements*

Statements in this category freely expressed the feelings of the hygienists on the value of the sessions. The majority of comments were favorable and they indicated that solutions were reached and the time spent was worth while. These general statements were interrelated to the other categories and served to reinforce opinion expressed more specifically elsewhere.

## **Suggestions**

For those desiring to use content analysis for evaluative purposes, the following suggestions may be helpful:

1. All reaction forms should be drawn up explicitly to meet the objectives of the program while still giving opportunity for freely expressed narrative statements.

2. There must be a separate category for each objective of the program so that analysis may reveal the degree to which the program has succeeded in its attainment of each objective.

3. Objectivity in the analysis should be maintained through standardization of indicators and through cross checking by various members of the research staff in order to maintain reliability.

## **Conclusions**

It has been demonstrated that the dental hygienists acquired an insight into problems of interpersonal relationships. Further, the dental hygienists appreciated and benefited from the discussion, participation, and resolution of problems through the group process. Content analysis did not show adequately the acquisition of professional knowledge and skills by the dental hygienists. The analysis was not able to measure the objectives of providing latest professional information and maintaining high professional standards, probably because these were long-range intangibles and this method does not readily lend itself to the evaluation of such factors. Generally, the evaluation showed that the program was a success and that the hygienists wanted to continue this type of inservice training.

## **REFERENCE**

- (1) Berelson, B : Content analysis in communication research. Glencoe, Ill., The Free Press, 1952, p 18.

# *Sickness as Recorded in Family Surveys*

There are many ways to express the extent of deviation from normal health in an observed population, such as the incidence of new cases of illness, the days of illness during a given period, the days of illness per case, and the prevalence of illness at a given time. These and other measures can be expressed in terms of rates or ratios for all cases and for cases of different severities, such as nondisabling, disabling, confined to bed, and admitted to a hospital, together with days per 1,000 population and days per case for cases of each severity. Thus, morbidity from all causes can be expressed in many ways, aside from similar rates and ratios for specific diagnoses.

Detailed data on illness have been collected in six surveys by periodic visits at intervals of 1 to 3 months to households in the general population, covering nearly 100,000 full-time person-years of observation. These surveys made over the past generation by, or in cooperation with, the Public Health Service afford considerable data on 103 diagnoses for all recorded cases, and only about half a dozen less for cases disabling or confining to bed for 1 day or longer. This study represents a detailed analysis of these records of illness in the general population, supplemented by records of hospitalization, particularly of mental diseases, tuberculosis, and a few other chronic diseases.

In the study it was not feasible to follow chronic cases throughout their total duration, so cases and their durations were expressed as "episodes" of illness. This procedure made it feasible to get some idea of seasonal variation by a tabulation by months of onset of such cases or episodes as had their onset during the study period.

No detailed discussion is needed here, but a few summary statements should be made regarding important findings:

1. These studies indicate total annual cases of illness of 1,060 per 1,000 population, or about one illness per person per year. Of these cases, roughly half (565 per 1,000) were disabling for 1 day or longer, and the other half were not dis-



*Public Health*

**MONOGRAPH**

**No. 25**

The accompanying summary covers the principal findings presented in Public Health Monograph No. 25, published concurrently with this issue of Public Health Reports. The authors are with the Division of Public Health Methods, Public Health Service.

Readers wishing the data in full may purchase copies of the monograph from the Superintendent of Documents, United States Government Printing Office, Washington 25, D. C. A limited number of free copies are available to official agencies and others directly concerned on specific request to the Public Inquiries Branch of the Public Health Service. Copies will be found also in the libraries of professional schools and the major universities, and in selected public libraries.

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Collins, Selwyn D., Trantham, Katharine S., and Lehmann, Josephine L.: Sickness experience in selected areas of the United States. Public Health Monograph No. 25 (Public Health Service Publication No. 390). 96 pages. Illustrations. U. S. Government Printing Office, Washington, 1955. Price 50 cents.



abling. Disabling is here used in the sense of causing the patient to be unable to perform his usual duties, such as work, housework, attending school, or other activities for 1 day or longer. Of these disabling cases, 405 per 1,000 population spent 1 or more days in bed because of the illness, and of the bed patients 56.4 per 1,000 population spent 1 or more nights in a hospital. These hospital patients constituted 10 percent of all disabling cases and 13.9 percent of all bed patients.

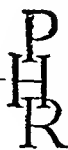
2. Of all disabling cases or episodes of illness, 13.4 percent were chronic; similar percentages of bed and hospital episodes of illness were 13.8 and 22.6, respectively. The mean duration of disability per acute illness or episode was 10.3 days, as compared with 63.6 days for chronic episodes; however, the annual days of disability per 1,000 population of the 5 surveys was 5,007 and 5,101 for acute and chronic illnesses, respectively, with a total for all cases of 10,108 annual days of disability per 1,000 population, or 10.1 days per person observed.

3. Of the acute disabling attacks, 96 percent were disabling for 30 days or less, as compared with 72 percent for chronics; to reverse the statement, only 4 percent of acute cases were disabled for more than 30 days, but 28 percent of the chronic cases were disabled that long. On the other hand, 24 percent of the acute cases were disabled for only 1 or 2 days, and 18 percent of the chronic episodes were disabled for only that long. Finally, 86 percent of acute cases were disabled for less than 18 days, and 47 percent of the chronic episodes involved less than 18 days of disability.

4. Variation with age and variation with season are shown for total cases of each specific diagnosis, and variation with age is shown for hospitalized cases for as many diagnoses as the smaller numbers justify. Variation with age and sex is shown for bed cases; for a few diseases the rates for women are exceptionally higher than for men, such as those of the thyroid gland, of the gallbladder and liver, appendicitis, neuritis, headache, nervousness, psychoneurosis, arthritis, diabetes, and injury by fall. On the other hand, some diseases had definitely higher rates for men, such as peptic ulcer, hernia, and traumatic lacerations.

5. The respiratory diseases show consistently greater seasonal variation, with peaks in January or February, with ear and mastoid diseases showing peaks also in February. The acute communicable diseases, hay fever, and the acute stomach and intestinal upsets also show large seasonal variation, but episodes of chronic diseases generally show much less seasonal variability.

6. Admissions to short-term general and allied special hospitals have increased rapidly since 1935, hospital days per 1,000 population less rapidly, but hospital days per hospital case have generally declined since 1935, and particularly since 1945. However, increases in hospital admissions and days of care per 1,000 population do not necessarily mean an increase in illness; higher incomes, the budgeting of hospital costs by insurance, and the increase in the general level of living have probably been large factors in the increase of hospital care even without any increase in day-to-day illness in the United States.



# A Mental Health Program is Born

By MURRAY GRANT, M.D., D.P.H.

THE DEVELOPMENT of a mental health program in Cattaraugus County, N. Y., has been an avocation of many of the county residents and the county's civic and health organizations during the past few years. A major and tangible result of the community's efforts is a countywide mental health clinic, now established in the Cattaraugus County Department of Health and in operation since May 1954.

Cattaraugus County has a population of 80,000 and is located in the western part of New York State. Its main city, Olean, is situated 70 miles southeast of Buffalo. The county is approximately 40 miles long and equally wide. It is predominantly rural and would not be considered a particularly wealthy county compared with many others in New York State.

It was Dr. C.-E. A. Winslow who said many years ago that "It would be highly desirable for such a county as Cattaraugus to make at least a beginning in the recognition of its mental problems; and this could, perhaps, best be accomplished by providing a psychiatric social worker to serve jointly with the social service staff and nursing staff of the county department of health. Through such a worker the extent of the local needs could at least be visualized and the county prepared to take its part in the development of the future" (1).

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*Dr. Grant has been commissioner of health of the Cattaraugus County Department of Health, Olean, N. Y., since 1951. He began his public health career in 1950 as assistant health officer of the Baltimore County Health Department in Maryland.*

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Mental health was recognized as a proper health department activity in the early days of the county health demonstration established by the Milbank Fund. As early as 1926 a psychiatric social worker was employed by the county health department, primarily as a consultant to the public health nurses. Although this experiment lasted only a few weeks, it showed that the importance of mental health in a public health program was recognized, even in those days. The New York State Commission for Mental Defectives has operated occasional mental health clinics in the county, and during 1924 and 1925 made 50 psychological examinations. In addition, Gowanda State Hospital, located just outside the county, has operated clinics within Cattaraugus County. These clinics are still maintained 1½ days a month, but they are now reserved for convalescent patients.

In April 1951, a Mental Health Committee was organized as part of the Cattaraugus County Tuberculosis and Public Health Association. This group became interested in stimulating a mental health education program. It held a number of meetings, distributed pamphlets, had several programs on the local radio station, and prepared news releases for publication in the local newspapers.

This committee proved there was an interest in the field of mental health, and, in March 1952, the committee was reorganized and renamed the Cattaraugus County Mental Health Society. It was still associated with the tuberculosis and public health association. Every possible effort was made to obtain representation from many interested individuals and agencies as well as to insure that the various geographic areas of

the county were represented. The following groups formed the nucleus of the society: county welfare department, Catholic charities, the clergy, county board of health, school authorities, parent-teacher associations, children's court, chamber of commerce, and the county medical society. In addition, members of the tuberculosis and public health association and the county health department became a part of the society. A factfinding committee was appointed at the initial meeting and asked to get information on mental illness and facilities in the county. This committee sought from various agencies and groups in the county answers to a number of questions such as:

1. What is the mental health need as determined by the number of patients in mental hospitals?
2. What preventive and treatment facilities are available locally?
3. What local professional groups are concerned with mental health?
4. What other community agencies or organizations influence mental health?

At the next meeting of the mental health society in May 1952, five committees were formed to investigate the various phases of the mental health situation which had been uncovered by the factfinding committee. These five committees had one of the following functions:

1. To investigate the need for a mental health clinic in the county.
2. To determine the need for, and practicability of, a psychiatric wing in one of the local hospitals.
3. To ascertain the best ways in which to disseminate mental health information.
4. To explore the possibilities of integrating mental health principles into the local governmental agencies.
5. To determine whether it would be desirable to promote local mental health groups in each community.

#### **Clinic Activities to the Fore**

Each of these committees met to discuss the problems to which it had been assigned. At the next general meeting of the society in September 1952, it was clear that the group had become particularly interested in mental health

clinic facilities. This was something tangible. This was a project which could lead to a sense of proud achievement and could form a base from which to approach the problems the group had found.

I need hardly interpolate that the county health department and the tuberculosis and public health association played a leading role in all of the foregoing activities and helped stimulate the mental health society by pointing out the possible avenues for exploration. At the same time a considerable number of news releases were drawn up to insure that the public was kept well informed of all developments.

The Committee on Mental Health Clinics became very active. Extensive inquiries and investigations were made. Speakers were obtained to talk on the subject at public meetings to which various civic officials were invited. People from all ends of the county attended the meetings.

The committee reported that Cattaraugus County had very little in the way of facilities to which the emotionally disturbed could turn. They could, of course, be committed to a mental hospital for observation and treatment. But this procedure was accepted with reluctance. There was no psychiatrist in the county, and, in general, residents of Cattaraugus County had to travel up to 70 miles for psychiatric care. Very few did this. The New York State Department of Mental Hygiene operated a traveling child guidance clinic one day a week. However, this service was very limited and did not, in fact, cover much of the county. Moreover, very little treatment was offered, and, since none of the clinic team members resided in the county, it was often difficult to reach them. In addition to this facility, the closest mental hospital, which was located just outside of the county, operated a clinic for adults 1½ days a month. However, this clinic was confined chiefly to patients convalescing from care at the mental hospital. The committee concluded that a mental health clinic was needed in Cattaraugus County. The remainder of the society agreed.

In the meantime, both the health department and the tuberculosis and public health association were active in stimulating local interest

in the project. While the association promoted and prepared mental health exhibits for the county fair, the health department was busy publicizing the matter widely. A mental health nursing consultant from the New York State Mental Health Commission was engaged to provide inservice training for the public health nurses. In addition, both organizations worked together in promoting the establishment of citizens' health committees in two communities in the county. These committees also helped inform the people of the area of the importance of mental health.

### **Funds and a Home**

The next problem was to determine how a clinic could best be established and how it should be organized and administered. Possible sources of funds were considered—the New York State Mental Health Commission, the schools, public subscription, and the county health department. At another public meeting it was finally agreed that the clinic could best be organized and administered as a division of the county health department. Accordingly, in May 1953, the chairman of the county mental health society asked health department officials if they could include an appropriation of \$30,000 in the department's budget for the year 1954 to establish a mental health clinic. This amount included funds for a full-time psychiatrist, clinical psychologist, psychiatric social worker, and a secretary. Although appropriated from county funds, 50 percent of the amount would be subject to State reimbursement.

In the meantime, health department officials had discussed the proposed clinic with the county medical society, with the county board of health, and with some of the prominent members of the county board of supervisors—the department's appropriating body.

In September 1953, the county board of health passed the health department budget, including in it \$21,240 for a mental health clinic for the year 1954. The difference in this figure and that suggested by the mental health society was due chiefly to the fact that the psychiatrist was to be employed on a part-time instead of

a full-time basis. A psychiatrist employed part time, it was suggested, could work 3 days a week for the health department and devote the remainder of his time to private practice. It was pointed out that not only would this arrangement be more likely to appeal to a psychiatrist, but also it was believed unlikely that the board of supervisors would pass a budget containing a salary high enough to attract a full-time psychiatrist. Plans to house the clinic in the health department and make other use of existing facilities helped keep the budget low. This, then, was the budget submitted to the county board of supervisors for their consideration.

Much now remained to be done to show members of the board of supervisors and the public at large why the mental health clinic was needed and how it would operate. A tremendous amount of effort was used by members of the mental health society and others through personal contacts, talks, and preparation of newspaper releases. In October 1953, the county medical society sent a resolution to the board of supervisors endorsing and recommending the establishment of a mental health clinic within the health department as proposed in the 1954 budget. This budget was adopted in November 1953 by the board of supervisors.

A psychiatrist, who met the required qualifications and was also socially acceptable to a fairly rural community that is not subject to much change was obtained and began work in the clinic in April 1954. Soon afterward all the other members of the clinic team were appointed, and the clinic actually commenced operation in May 1954.

### **In Operation**

The people in the county had shown a great deal of interest in the clinic. To retain and advance that interest an advisory committee was formed in March 1954 to help develop policies and procedures for the mental health clinic and to assist in interpreting the clinic's functions to various agencies and communities in the county.

The advisory committee was composed of representatives of the welfare department, children's court, Catholic charities, school authorities, the medical society, the mental health society, Alcoholics Anonymous, industry, the

tuberculosis and public health association, the county board of health, and the clergy. Actually, many of these persons formed the nucleus of the mental health society. The committee had its first, and very successful, meeting in April 1954.

In the first 3 months of operation there were 228 visits to the mental health clinic. The patients, both children and adults, were referred by physicians, the welfare department, clergymen, schools, public health nurses, and the children's court. Some of them came without referral. In general, the clinic sees all comers, although persons under the age of 16 are not interviewed until a parent has been seen. All patients have an initial orientation interview with the psychiatric social worker, who determines whether the patient requires psychiatric and psychological examinations. After completion of a psychiatric examination, the members of the clinic team meet to discuss the case and formulate plans for treatment.

The clinic has just started, of course. Much work remains in combining the clinic service

with an education and training program for physicians, nurses, school personnel, and others. We are headed in this direction, but we realize that it will take time. Already one of the community health committees mentioned previously has formed a mental health committee to work with the mental health clinic team, and I feel sure that many others will follow.

At present, we are in the process of interpreting the intake policies and procedures for the clinic to other agencies and groups. We hope to bring other members of the health department and other agencies and individuals into close association with the mental health clinic team so that the mental health clinic will form the nucleus of a complete mental health program that will reach into all areas of the county.

#### REFERENCE

- (1) Winslow, C.-E. A.: *Health on the farm and in the village; A review and evaluation of the Cattaraugus County health demonstration, with special reference to its lessons for other rural areas.* New York, Macmillan, 1931, 281 pp.

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## PHS Advisory Council Appointment

**Dr. Currier McEwen**, dean of New York University College of Medicine since 1939, has been appointed to the National Advisory Arthritis and Metabolic Diseases Council. Dr. McEwen is chairman of the Medical and Scientific Committee and a board member of the Arthritis and Rheumatism Foundation. He is also chairman of the Medical Advisory Council of the Masonic Foundation for Medical Research and Human Welfare and co-chairman of the New York University Study Group on Rheumatic Diseases. Dr. McEwen obtained his medical degree at New York University, and he was awarded the honorary doctor of science degree by Wesleyan University and by Marietta College. He served his internship at Bellevue Hospital in New York City. He was associated with the Rockefeller Institute from 1927 to 1932 and then went to New York University College of Medicine to become assistant dean and instructor in medicine.

*Representing Pennsylvania's third annual health conference, held in August 1954 at State College, Pa., are the papers summarized in this section. Four deal with chronic illness and one with the work of the local health laboratory.*

## Pennsylvania Health Conference

### Cardiovascular Health Center in New York



In coronary heart disease and hypertension, foremost among chronic disease control problems, much excellent research is being done to improve our understanding of the basic mechanisms causing the conditions.

Keys, for example, has gathered much evidence for the theory that a high proportion of fat in the diet is related to the development of atherosclerosis of the coronary arteries. He has demonstrated that countries having a high proportion of fat in the diet also have high death rates from degenerative heart diseases. Morris and co-workers suggest that occupational groups associated with physical exercise have lower death rates from coronary heart disease than do those who work at more sedentary pursuits. Gertler and associates have mar-

shalled evidence that persons of the mesomorphic-endomorphic body type seem especially prone to develop coronary heart disease. Levy and associates have pointed out that hypertension develops in individuals who have labile blood pressure or tachycardia. The relationship of obesity and hypertension is also well known.

For a long while official health departments have been waiting for basic studies to give answers which can be translated into control programs. Meanwhile most health officers have contented themselves with some peripheral activities in the heart disease field, such as postgraduate education of physicians and nurses, provision of cardiac consultants for certain clinics, and the extension of public health nursing services to cardiac patients. A few departments have become interested in rehabilitation of the cardiac patient, largely a problem of the patient's attitude and that of his employer toward the disease.

#### Health Department Job

But none of these measures is meeting the main issue. Knowledge required for the control of disease has often preceded that concerning its etiology and pathogenesis. The public health physician has behind him years of experience in controlling diseases before their cause has been determined. This has been true of cholera and typhoid fever, the prevention of leukemia among radiologists, and the control

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of diabetes. Adult heart disease may present more of a challenge, but this should serve mainly to give it a high priority for our public health resources.

One method of approach open to official health agencies is a study of the epidemiology of coronary heart disease and hypertension. Departments of health have teams of trained epidemiologists, statisticians, and, recently, social scientists. They possess the legal responsibility to take necessary measures to control prevalent diseases. Health departments, furthermore, are the legal custodians of morbidity data, and through their liaison with medical and other professional societies and their association with industrial health programs, they are indeed in a fortunate position to pursue such studies.

But the official health agency has a far greater responsibility than the undertaking of discrete epidemiological studies. It must mobilize its resources more completely for a large-scale, long-term study of coronary heart disease and hypertension.

### New York Study

In New York State it was decided that the official health agency is not only able to undertake long-term longitudinal studies, it is the organization best able to make them. This decision led to the establishment of the cardiovascular health center program in February 1953.

The cardiovascular health center has been established as a part of the Albany Medical College under contract with the New York State Department of Health. The dean, professors of medicine and radiology, and the associate professor of medicine for cardiology are members of the governing council. The close and continuous association of the project with a medical school makes available to it all the clinical specialties and preclinical science departments of the school.

Another essential of such a project is close and continuous association with the professional personnel of the State health department. The governing council of the cardiovascular health center includes the commissioner of health and the assistant commissioners of medical services,

laboratories and research, and program development and evaluation. In addition, at a series of training and discussion staff meetings, all the bureau directors were asked to devise ways in which their programs could assist the heart disease activities and goals of the cardiovascular disease center and how, in turn, the center's activities could assist their programs. The program development and evaluation unit maintains continuous liaison between the center and the other programs of the State health department. Statistical service is provided by the State health department.

A third criteria is a suitable stable population of sufficient size, willing to cooperate in this type of study. The male civil service population between the ages of 40 and 54 in the Albany area, numbering about 2,000 individuals, was selected as a group of sufficient size, stability, and susceptibility to give statistically significant results under a program of long-term study of the cardiovascular center. Eighty-seven percent of those contacted have received the first examination on a voluntary basis and have agreed to follow through the periodic examination program at the center. Participants with significant medical findings are referred to their private physicians for treatment.

An attempt is being made to discover how to diagnose coronary heart disease and hypertension in the earliest possible preclinical phase. This diagnosis will make epidemiological studies of these conditions more effective by broadening the number of conditions that can be listed as early stages of these diseases.

### Diagnostic Tests Applied

The center is applying existing diagnostic tests periodically to the same population. As cases of coronary heart disease accrue, we may then search back through the examination records in the hope of discovering which findings suggest the development of degenerative heart disease. Keys has suggested that more attention should be paid to the measurable variations among so-called normal individuals, since some of these differences may be significant in predicting the development of later chronic illness. Preliminary blood pressure and weight measurements made at the center on 1,051 par-



ticipants in the study suggest that the higher blood pressures tend to occur more frequently among persons of greater body weight.

Among the tests used by the center is an electrocardiogram following measured physical stress administered either through the Master's stairstep test or the treadmill. Of the first 1,072 participants studied, the diagnosis of coronary heart disease was made in 27 cases in the preliminary findings. Nine were in groups diagnosed by history alone, 10 by history plus electrocardiogram, and 8 by electrocardiogram alone. In the latter group, three cases were discovered solely through the use of the stress test.

In this type of project the applicability, reliability, and validity of existing diagnostic tests for heart disease should be studied in order to discover which are suitable for more general application to the community. This information, too, will facilitate future community epidemiological studies. Tests made at the center indicate that cardiac enlargement can be measured by both X-ray and electrocardiogram and that each of these techniques discovers a group not discernible to the other. Studies are also proceeding on the use of skinfolds in the determination of obesity and on the cost, availability, speed, and safety of the various detection tests proposed for wider usage.

The cardiovascular health center must serve as a core for research teams interested in performing both basic and applied research. Thus, it is working in cooperation with the new protein laboratory of the New York State Health Department, which has ultracentrifuge, electrophoresis, and blood fractionating equipment for the study of lipoproteins. The State laboratory, with its long experience in immunology, can study possible parallels between this field and the biological mechanisms responsible for chronic disease. The bureau of nutrition of the department is investigating the obesity measurements and diet histories of participants. Social scientists in the department are interested in social and emotional stress and heart disease. Epidemiologists are taking retrospective histories on hospital patients to check the association between clinical heart disease and certain factors. Members of the Albany Medical College department of medicine

are engaged in studies on basic physiological mechanisms associated with the cardiovascular status of the participants.

## Progress in State Rehabilitation Program

**PHR** Some time during our lives each of us has seen someone fall victim to a serious crippling disease or disabling injury: some we remember as "shut-ins," while others we hazily recall as being in the hospital for a long time. Some get around a little, trying to work occasionally at odd jobs; the others are confined to a bed or wheelchair.

Many of these people just seem to disappear from our personal lives. They join that army of disabled people who fill the chronic disease hospitals, the back bedrooms of thousands of homes, the mental institutions, the nursing and convalescent homes, the institutions for the aged and infirm, and homes for the poor. Physicians and nurses know about them, for the institutions are so crowded that applicants and their families must be carefully screened and checked to make sure that only the most urgent cases are accepted.

### Decade of Progress

We have recently closed a significant decade of progress in rehabilitation in which we have discovered that many men and women formerly destined to lead a life of dependency can be rehabilitated. The way has been pointed toward a more complete approach to the problems of the disabled person. No longer do we consider the social, physical, or economic effects of a disability as separate entities in an individual.

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*By Floyd L. Kefford, chief of physical restoration, bureau of rehabilitation, Pennsylvania State Board of Vocational Education.*

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Rather we see the many phases composing the individual as interrelated, one with another—his job, his family, his physical condition, his place in the community, his desires, and all of the attainable factors comprising the entire person.

It is also possible with the new drugs, the improved techniques of surgery, better hospital facilities, the establishment of comprehensive rehabilitation centers, and the employers' realization that ability, not disability, counts that thousands can leave their wheelchairs, their hospital beds, and their homes to become self-sufficient.

Ten years ago who could foresee that a paraplegic mother bedfast in her home could be physically improved enough to resume the responsibilities of raising her children and making a living for her family; that a boy so badly crippled with arthritis that he was unable to bend any joints except those in his arms and hands could become a successful watch repairman; that a 45-year-old railroader, forced to give up his chosen vocation because of a severe cardiac condition, could undergo surgery enabling him to return to full employment.

### Maximum Help

Pennsylvania has demonstrated that these citizens can be improved physically and prepared vocationally for employment through the services of the bureau of rehabilitation, a State agency under the supervision of the Pennsylvania State Board of Vocational Education. With its trained staff of counselors, medical consultants, and full complement of services, which include medical and psychological evaluation, surgery, hospitalization, appliances, vocational training, and maintenance, the bureau is prepared to help chronically disabled clients achieve maximum rehabilitation.

Probably the most important single factor in the development of Pennsylvania's rehabilitation program during the past 10 years was the inclusion of physical restoration as a part of the services offered by the bureau of rehabilitation through enactment of Public Law 113 in 1943. By the passage of this bill the Federal-State rehabilitation program definitely joined hands with the men of medicine. Their knowl-

edge of how physical defects can be reduced or corrected plus the counselor's knowledge of how to prepare a client for a suitable vocation made it possible to achieve maximum rehabilitation for the client with a chronic disability.

Before this phase of the program was developed the counselor encountered many problems. He was required to "rehabilitate around" a disability which could have been reduced or corrected with good medical services. A young girl with an unattractive clubfoot supported with a brace, for example, was helped in her mental adjustment, trained for suitable work, and placed in a remunerative job, but the chronic physical condition remained. Today, through the physical restoration services available in the bureau's program, such a case would be treated differently. The foot could be amputated and the client fitted with an artificial limb. Taught to use it and to dress and walk like other girls her age, she would have little left of her "chronic disability."

For persons with cleft palates and harelips—to illustrate from a different area—rehabilitation was not considered feasible because the disability interfered with the client's preparation for an occupation commensurate with his capabilities or with his attainment of experience necessary for entering an occupation. Many of these people were placed, without service, in jobs requiring menial labor, where they did physical work but gained no mental satisfaction. This deepened their emotional problems, and they were considered misfits in society. Now it is possible to provide these clients with prosthetic appliances which enable them to speak and with surgery which can reduce the disability to the point where one would hardly be aware that it exists. For such persons the physical restoration program has opened a new world.

### 60 Percent of Total

But what has all this to do with meeting the problems of those who are handicapped because of a chronic disability? A review of the bureau's case records of the 3,011 persons rehabilitated in 1953 revealed that 1,817 of them were disabled because of disease, amounting to 60

percent of the total rehabilitated. Among these 1,817 clients are cases of poliomyelitis, epilepsy, hemiplegia, paraplegia, cardiac involvement, mental illness, diabetes, tuberculosis, bronchiectasis, silicosis, hearing deficiency, Buerger's disease, cerebral palsy, and cancer. Today these people are all gainfully employed and are now "tax-paying" instead of "tax-costing" citizens.

The bureau has not provided rehabilitation services for narcotic addicts, but it has helped many disabled individuals who, because of their disability and the factors involved, have become alcoholics. The division of alcoholic studies of the Pennsylvania Department of Health is now establishing facilities throughout the State for the treatment of alcoholics, and the bureau of rehabilitation is planning to assist in the rehabilitation of those who in addition to being alcoholics also have employment handicaps.

In 1953, the State legislature appropriated more than \$2 million for the construction of a comprehensive rehabilitation center in Pennsylvania. With the completion of this facility and the expansion of the rehabilitation program through passage of new laws by Congress in 1954, the bureau's program will provide additional services for chronically disabled individuals.

## Chronic Disease Factor In Public Assistance

**PHR** Studies of public assistance recipients in Illinois, Connecticut, New Jersey, and Wisconsin show that about one-fourth are chronic invalids. An analysis of the public assistance rolls in Pennsylvania indicates about the same proportion of chronically ill persons.

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*By Robert P. Wray, deputy secretary of the Pennsylvania Department of Public Assistance.*

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On Pennsylvania's present assistance rolls are 60,000 persons, age 65 or over, in the old-age assistance category; 16,000 persons in the blind category; 12,000 permanently and totally disabled persons in the aid-to-disabled category; 103,000 persons in the aid-to-dependent-children category, approximately 26,000 of them adults; and 42,000 persons receiving general assistance, most of whom are adults. It is observed from the description of these categories that the bulk of assistance recipients who are chronic invalids are in the old-age assistance, blind pension, and aid-to-disabled categories. Collectively these constitute the hard long-time core of the public assistance rolls.

### Cause of Impairments

A study the Pennsylvania Department of Public Assistance made of the social and medical characteristics of persons receiving financial help in the aid-to-disabled category showed that three types of diseases or conditions account for nearly two-thirds of all the major impairments suffered by these recipients. Heart and circulatory diseases rank first and account for 33 percent of the major impairments for the total group. Paralyzing conditions account for 20 percent of the impairments, and arthritis and other bone diseases fall in third position with a rating of 12 percent. Respiratory diseases, mental and psychiatric disorders, and tuberculosis each accounts for 6 percent of the major impairments. Three percent of the total impairments are attributable to cancer, syphilis, ear and eye diseases, and epilepsy, respectively. Diseases of the digestive system occur in 2 percent of the recipients, and diabetes is the cause of the major impairment in 1 percent of the cases. The other 2 percent of the recipients have a variety of major impairments that are too diversified to classify.

Forty-two percent of the group studied had been impaired for 10 or more years; 20 percent, between 5 and 10 years; 27 percent, between 2 and 5 years; and in 8 percent of the instances the elapsed time since disablement was less than 2 years. The period of disablement was not reported for the remaining 3 percent.

Approximately 6 percent of the impairments

suffered by the group studied were caused by diseases or injuries resulting from employment. The incidence of such disabilities increases rapidly with age and is much higher for men than for women. Injuries not connected with employment are responsible for only 4 percent of the major impairments. Congenital conditions or injuries at birth account for approximately 5 percent of the disabilities. The great majority of disabilities are brought on by age or serious illness and for the most part are chronic or degenerative diseases. Heart and circulatory ailments are the most common. About one-third of the mental and psychiatric disorders are congenital or were caused by certain injuries, as were about one-fifth of the epileptic impairments.

### Where They Live

Most of these disabled persons are living in their own homes or at the homes of relatives or friends. With considerable effort they manage to care for themselves, and many of them undergo suffering and distress because they do not have other persons to care for them.

About 5,500 recipients of assistance, most of them chronic invalids, reside in institutions. About one-half of these are in nursing or convalescent homes. About one-fifth are in commercial boarding homes for the aged and another one-fifth, in other miscellaneous homes for the aged. The remainder are blind persons living in homes maintained by county institution districts. Under Pennsylvania's public assistance laws only blind pensions can be granted to persons residing in a public institution. Most of this group of 5,500 persons are able to manage their own affairs, and guardians or trustees have been appointed for only a small fraction. All of these persons, however, need some services beyond the basic items of food, shelter, and laundry. They are predominantly an aged group. The average age is 78 years, and 7 percent are 90 years of age or more.

A comparison of the above figures with similar studies made in other States indicates that these same relationships for all disabled persons are found rather generally throughout the

country. In a booklet entitled "Care of the Long-Term Patient," the Public Health Service has reported some comprehensive statistics for 1950. The study showed that in the country as a whole there were an estimated 5,298,000 persons who had been disabled for more than 3 months. Seventy-nine percent of these were living in places outside of institutions, such as their own or other private homes, boarding houses, or hotels. Twelve percent were in mental hospitals; 7 percent were in homes or schools for the handicapped and the aged and dependent; 1 percent were in tuberculosis hospitals, and less than one-half of 1 percent were in chronic disease hospitals and correctional institutions.

### Money Grants

Under Pennsylvania's public assistance program, money grants are made to persons who are found to be in financial need on the basis of schedules of assistance allowances established by the Pennsylvania Department of Public Assistance with the approval of the Pennsylvania State Board of Public Assistance. Grants are made either to the assistance recipients themselves or to a trustee or guardian.

As mentioned, persons receiving a blind pension may reside in a public institution where they receive care and attention. Other recipients may reside in various types of privately operated institutions, but the assistance allowances do not include any additional amount of money necessary to pay for institutional services.

Under Pennsylvania law, county institution districts have a responsibility for persons who are physically and mentally infirm. As a result of a divided responsibility between the department of public assistance and county institution districts for indigent persons who are physically or mentally limited, it is an understatement to say that their needs are not being adequately met. But even if legislation is enacted to fix responsibility for this group of persons, this action in no way will decrease the number of persons who are financially dependent and in need of care.

The basic problem of disabled persons, including those with chronic illnesses, should be met by providing facilities for the care, treatment, and rehabilitation of those presently afflicted with chronic illnesses and by conducting an intense program of research into the causes of chronic illness in order to reduce the incidence and improve the methods of treatment. For the long run only the latter alternative will provide a solution.

## Facilities Inventory For Chronic Sickness

**PHR** In Pennsylvania, one of the greatest needs of patients with chronic illness is for better facilities. Pennsylvania does not have one hospital specifically designed for the care of the chronically ill. However, four projects of this type have been requested under the new Medical Facilities Survey and Construction Act of 1954.

The chronically ill patients are now being cared for in the existing 1,344 institutions supervised or licensed by the bureau of homes and hospitals of the Pennsylvania Department of Welfare. These institutions by classification are 356 hospitals (exclusive of mental); 419 licensed nursing and convalescent homes; 289 licensed boarding homes for the aged; 218 nonprofit homes; and 62 county homes. Eighty-seven of the hospitals are licensed proprietary, and the rest are incorporated nonprofit.

Pennsylvania needs 20,968 beds for chronically ill patients, or 2 beds per 1,000 population, according to the 1954 revision of the State plan required under the Hospital Survey and Construction Program. Twenty-four facilities

are now supplying 1,613 acceptable and 358 non-acceptable beds. Nursing, convalescent, and boarding homes account for approximately 10,390 of the remaining 18,997 beds.

Under Pennsylvania law every home keeping for profit one or more persons requiring care, treatment, or nursing for sickness, injury, or other disability is required to be licensed. Every home providing for profit service or domiciliary care for three or more elderly persons who are not ill or in need of nursing care must also be licensed. No person classified as a patient may be kept in a licensed boarding home for the aged.

County homes give care—some of it good and some very poor—to all types of dependent persons. Fourteen county homes have approved medical facilities. Nine counties have no county homes. The department of welfare is making determined efforts to improve the care of the residents of these homes. One of the greatest problems facing the department is to get the individual county institution district authorities to recognize their responsibility for the care of their ill dependents. This responsibility is placed on these authorities by the county institution district law, which states "dependent means an indigent person requiring care because of physical or mental infirmity." A survey completed in the spring of 1954 shows that 43 counties contribute to patient care in nonprofit hospitals.

Responsibility for supervision of nonprofit homes for the aged was placed with the Pennsylvania Department of Welfare by the 1953 session of the State legislature. Rules and regulations for this group have been completed and mailed to them.

Although the number of institutions responsible to the bureau of homes and hospitals is steadily increasing, we do not now, nor can we in the foreseeable future, have anywhere nearly enough homes for all of our needy aged and chronically ill. Therefore, the department of welfare is doing all it can through education and consultation to see that the institutions under its supervision meet State requirements and give proper care to the needy residents of the State.

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*By Ira J. Mills, director of the bureau of homes and hospitals of the Pennsylvania Department of Welfare.*

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# The Local Health Laboratory

**PHR** Laboratory service related to health is a cooperative effort between laboratory scientists who provide factual data and qualified persons who apply the data to the individual, the group, or the community.

To provide service intelligently, the laboratory should have some knowledge of the conditions under which the specimens were collected and other pertinent facts that will direct the laboratory efforts into productive channels. It must be aware of any special problems peculiar to the specimen which might influence the scientific findings of the laboratory.

The physicians or health officers the laboratory serves should receive laboratory reports as early as possible. Every day, in fact every hour, that passes between the time the specimen is collected and the time the report is received means just that much delay in applying the scientific facts of the report to the diagnosis of the disease and its indicated treatment or in instituting the proper measures to control its spread.

In short, close liaison must be maintained between the laboratory and its patrons if the service is to be effective and efficient. Local laboratories have the advantage of prompt communications—face-to-face conferences, local telephone calls, and short-distance written communications.

The liaison is particularly important to local, county, and district health departments since scientific facts, which can be determined only in the laboratory, are frequently the basis on which health department activities rest. No health department, regardless of the size of the population it serves, can operate efficiently without prompt laboratory service, which is best furnished by a local laboratory.

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*By Edmund K. Kline, Dr.P.H., director of laboratories, Cattaraugus County Department of Health, Olean, N. Y.*

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Although for many years the larger municipal health departments have maintained laboratories to provide local service, public health authorities have been slow to recognize the need for local laboratory services for suburban and rural populations through laboratories organized as integral divisions of local health units.

## Decentralization

In the field of public health, laboratory service, in general, has been supplied by State health departments on a statewide rather than a local basis. In a small State, the central laboratory can perhaps serve the entire State, but centralized service in a larger State becomes increasingly difficult because of the lack of proper and prompt communication.

Many States now have programs aimed at decentralizing laboratory services, either by establishing branches of the central State laboratory or by stimulating the formation of local laboratories.

The State branch laboratory is actually a part of the State laboratory, under direction of the State laboratory director. Its personnel are State employees, and it is financed by the State as a part of its laboratory budget. It is usually placed in a strategic communications center for the purpose of getting the maximum amount of rapid mail service from the largest possible territory.

Maryland and Alabama, for example, have branch laboratory systems covering the entire State. Maryland maintains 12 branch laboratories in addition to the central laboratory in Baltimore, and Alabama maintains 8 branch laboratories directed from the State laboratory in Montgomery. Several other States maintain a few branch laboratories at strategic points but do not have a statewide coverage. Michigan has branch laboratories in Grand Rapids and Houghton, and Pennsylvania has branches in Wilkes-Barre and Pittsburgh.

The development of decentralized local laboratories integrated into a statewide system, but maintained by local communities, is well illustrated by the experience of New York State. The basic law promoting such service, passed in 1923, permits the county governing body, the

board of supervisors, to establish local laboratories to serve a whole or a part of a county. The same law permits the establishment of municipal laboratories by the city council or the incorporation of municipal services into the county laboratory district.

These local laboratories may be operated as independent services under a county board of laboratory managers or as an integral part of a city or county health department, or the city or county may contract with a hospital to have both public health and hospital services performed in a single laboratory. They operate under the supervision of the division of laboratories and research of the New York State Health Department, which inspects them, sets standard qualifications for their directors, reviews their methods, and issues annual certificates of approval to them.

A provision in the New York State law granting State aid to the extent of 50 percent of the net cost of operating the laboratories encouraged and stimulated their establishment. As a result of these permissive laws, New York State has some 45 city and county public health laboratories, most of them operating in conjunction with hospitals. In addition, about 105 hospital and private clinical laboratories have State health department approval although they do not receive financial assistance.

California has some 43 local laboratories administered under the jurisdiction of local health officers and supervised by the State laboratory.

### Scope of Service

The scope of local laboratory service depends in part on the program of the local health department and in part on other local laboratory services available. It may even include services related to clinical and hospital medicine.

Traditionally, public health laboratory services have been related to communicable disease control and sanitation. All other laboratory services related to health have been classified as clinical and usually have not been performed in a public health laboratory.

However, in recent years the concept that all disease is a problem of the community has gained considerable headway, and official health departments have expanded their activities to

embrace such programs as diabetes and cancer control, geriatrics, dental hygiene, and mental health problems—programs that go far beyond communicable or community disease.

The prevention and control of communicable disease will certainly continue to be a part of all health department activities, and all local laboratories will continue to be prepared to identify the causative organisms and the vectors of such diseases and to perform the sanitary examinations that are concerned with their spread in a community.

If the local health department operates clinics or hospitals, the local laboratory will perform the examinations that will provide diagnostic or prognostic information regarding the patients attending the clinics or served by the hospitals.

Except for the diagnostic services with relation to communicable diseases, the services required by private practitioners will usually be referred to private commercial or hospital laboratories. However, if other local facilities are not available, services in such fields as hematology and biochemistry may have to be provided by the local health laboratory.

The health laboratory should also be prepared to serve the entire community in certain specialties, such as parasitology and mycology, if these services are not available at other local laboratories.

If, as is the general pattern in New York State, the public health laboratory is also acting as a hospital laboratory, its scope of service will be all-inclusive. The only distinction between public and private service is that patients who can afford to pay are usually charged a fee for all service not directly related to the communicable diseases. Welfare patients, or those classed as medically indigent, receive all services free of charge.

### Organization

In even the smallest laboratory some effort should be made to departmentalize the work even though two or more departments must be combined under a single individual. Departments of bacteriology, serology, sanitary bacteriology and chemistry, hematology, and clinical chemistry, in addition to service and cleri-

cal departments, are the essential ones. If hospital service is included, a separate department of tissue pathology is indicated. Specialties, such as parasitology, mycology, and virology, which do not furnish a volume of work sufficient to support a department, should be integrated into other departments according to the knowledge and skill of the workers in them.

Even if the laboratory staff is too small to provide one worker for each department, it is a great convenience to group the materials and supplies needed for each of the separate activities in one part of the laboratory and to attempt to arrange the flow of specimens through the laboratory as though there were separate and distinct departments.

Broad training in the laboratory sciences is indicated for the personnel in a local laboratory. Obviously, if one person has to serve in more than one department, he will have to be skilled in more than a single scientific specialty. Not many such broadly trained persons are available, but, if necessary, inservice or brief postgraduate training courses may be used to teach competent employees to function in several of the specialties.

### Integration in a State System

If a comprehensive local laboratory coverage is developed and maintained, it must not be assumed that the services demanded of the State laboratory will decline. In fact, exactly the reverse is true, for in New York and California, the two States with the most comprehensive local laboratory coverage, the State health department laboratories have grown steadily year after year in response to new service demands. True, there may be a shifting away from the performance of simple routine examinations and concentration on the more specialized types of service and greater administrative and research responsibilities.

The local laboratory will be dependent upon a central State laboratory for many parts of its service program. In certain instances, it is desirable to have unexpected or unusual findings checked by some authority. For this purpose a State laboratory should offer a reference diagnostic service to review and confirm such results. The local laboratory will not be able

to employ experts in every scientific field. However, the State laboratory usually has such experts on its staff or has access to them through Federal agencies or educational institutions.

In certain technical fields it is neither desirable nor profitable for the local laboratory to carry its specimens to the final end result. For instance, the exact antigenic analysis of every *Salmonella* species isolated in a local laboratory is unnecessary. Culture of such organisms should be referred to the State laboratory for final studies.

Certain laboratory reagents can only be prepared and standardized in laboratories with access to sufficient clinical material to afford a proper evaluation. Other reagents are best prepared in large batches, each batch being carefully standardized so as to be of uniform titer and reactivity with previously used batches. The State laboratory should assume responsibility for all such reagents, either by actually preparing them or by testing commercial products and distributing them to the local laboratories.

### State Responsibilities

The State laboratory should be the scientific center around which all of the laboratory work in the State is focused. It should keep abreast of new scientific and technical developments, determine their applicability within the State, and if found desirable recommend them to the local laboratories. It should also assume some administrative responsibility for the quality and uniformity of services provided by local laboratories.

Some uniformity of methods and reporting should be common to all local laboratories within a State. For instance, in reporting serologic tests for syphilis, it is confusing to have one laboratory report a result of 3+ while its neighbor reports it as positive 2 dils or 6 units. Likewise, it is not desirable to have one laboratory report on complement fixation tests alone while its neighbor reports on flocculation tests alone. Discrepancies, which will reflect on both laboratories, are bound to occur.

Either the State laboratory should prescribe and approve all methods, as does New York, or else the results of test specimens sent out by the



State laboratory should be used as criteria for assurance that comparable work is being performed by the local laboratories.

To minimize errors in technique or deviations from the accepted methods that may lead to incorrect results, the State laboratory should submit a series of "test specimens" to local laboratories from time to time. This procedure will check the actual performance of these laboratories against each other and against suitable control laboratories.

Maryland and Massachusetts have developed extensive programs of this type. Many other States have tried limited programs, and almost every State has used test specimens for syphilis serology in programs patterned after the Federal program for evaluating State laboratories.

The struggle to insure competent personnel for all laboratory services is a continuing one. The State laboratory should assist the local laboratories to maintain a high level of competence by setting standards, both in education and experience, for all local laboratory employees, and it should insure that these standards are met.

New York approves the qualifications of local directors only. California licenses all technical

employees after examination. Connecticut requires all serologists in local laboratories to prove competence by performance tests in the State laboratory.

The California State Health Department also licenses all schools giving courses in laboratory science and issues registration certificates to all trainees in such schools. Upon completion of a prescribed training course, the State gives examinations. Those passing the test are licensed to work either in health department laboratories or in the 800 to 900 clinical laboratories licensed in the State.

The State laboratory can assist in training by encouraging personnel from local laboratories to spend training periods in the State laboratory. Refresher courses may be offered in the State laboratory or in selected training centers covering various regions of the State. Specialty experts can be sent on trips to local laboratories. Some States have made scholarships available to local laboratories for advanced study at educational centers.

Finally, the State laboratory should take active leadership in all activities of health laboratories of all kinds in order to weld them into a harmonious service system.

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## On the Care of Premature Infants

"Your Premature Baby," a pamphlet for parents of prematurely born babies, has been recently issued by the Children's Bureau, Department of Health, Education, and Welfare, as a supplement to the bureau's booklet on "Infant Care."

All babies weighing  $5\frac{1}{2}$  pounds or less at birth are usually considered as premature.

The new leaflet tells parents what happens to their child at the hospital until the time when he is ready to be brought home and why he may need special care. It provides brief answers to the questions that parents most commonly ask, such as: Will the baby always be small and weak? Will he be "late" in developing? Will he be normal mentally? Does a 7-month premature infant have a better chance of surviving than an 8-month infant has?

Copies of the new publication may be purchased from the Superintendent of Documents, United States Government Printing Office, Washington 25, D. C., for 10 cents each.



# technical publications

## Management of Venereal Disease

*Public Health Service Publication No. 327. Revised 1954. 14 pages.*

The 1954 revision of this pamphlet briefly states the latest (as of June 1, 1954) information available on the treatment and re-treatment of venereal diseases. The pamphlet is available to physicians, nurses, students of medicine and allied professions, medical societies, and other professional groups.

The schedules for treatment of primary and secondary syphilis are based upon experience of the Venereal Disease Branch, Public Health Service. Schedules for treatment of other stages of syphilis and other venereal diseases are based upon experience of various workers and have been used satisfactorily at the Service's treatment centers.

The management of gonorrhea, nonspecific urethritis, saprophytic prostaticitis, balanitis, chancroid, granuloma inguinale, and lymphogranuloma venereum, as well as syphilis, are outlined in the pamphlet.

## Chronic Illness

### Digests of Selected References, 1950-52

*Public Health Service Publication No. 305 (Public Health Bibliography Series No. 1, Supplement). 1953. By Violet B. Turner. 262 pages. \$1.00*

In 1951, digests of selected references on chronic disease published before 1950 were issued as Public Health Service Publication No. 10. This supplement contains digests of articles and books published during 1950-52. The digest numbers are continued from the earlier bibliography and the indexes cover both publications.

In a few instances publications issued before 1950 and early in 1953 are included. A new section on planning, design, and construction of institutions for the chronically ill, for example, was made as complete as possible by including some earlier references even though a few entries duplicated those in the first volume. Other new sections are those on coordination of facilities and services and on prevention and control. The subsection on nursing homes has been divided into three parts to facilitate its use.

Rehabilitating sections in the bibliography are: dimensions of the problem, contributory factors, rehabilitation, non-institutional services, and institutional services.

Clinical material dealing with specific medical diagnosis or treatment of chronic disease has been excluded in both volumes.

## Communicable Disease Center Activities, 1952-53

*Public Health Service Publication No. 391. 1954. 31 pages; illustrated.*

Intended as an aid to State, local, and other health agencies in planning their programs, this report summarizes the major activities of the Communicable Disease Center, Bureau of State Services, Public Health Service, during the fiscal year 1953.

It treats in general terms, rather than precise grouping, the scope, nature, and interrelationships of activities as conducted in different areas of the public health field by the CDC staff. The current structure of the center is shown in a flow chart; its professional personnel are described, and field installations are listed.

The report discusses projects pertaining to established procedures and practices, such as administration and management, epidemic intelligence service and disaster aid,

laboratory training, disease control operations and demonstrations, control of arthropod vectors and animal reservoirs of disease, and training programs for field work and for aids.

The section entitled "Activities Directed Toward Specific Diseases" discusses the CDC activity in relation to such individual diseases as anthrax, diarrheal diseases, encephalitis, leprosy, malaria, pinworms, poliomyelitis, rabies, trichinosis, and many others.

## Report of Local Public Health Resources, 1952

*Public Health Publication No. 398. 1954. By Clifford H. Greer, Josephine R. Campbell, and Kathryn Connor. 85 pages; tables.*

This annual report of personnel, facilities, and services in local areas is the sixth since 1946 in a series of analyses based on data submitted to the Public Health Service by full-time local health organizations. Data for 1948 is unpublished.

Those units reporting as of December 31, 1952, (excluding Alaska, Hawaii, Puerto Rico, and the Virgin Islands) number 1,313 organizations and include 2,207 counties and 215 independent city health departments serving more than 88 percent of the population of the United States. Approximately 50 units did not report.

The current analysis in addition to the extent of coverage is presented in these categories: personnel engaged; selected public health services and clinical facilities; selected community sanitation facilities and services; and per capita expenditures for public health and per capita income of areas served.

The number of personnel employed full-time increased over the previous year. Public health nurses continued to be the most acute staffing deficiency in the majority of health units, followed by sanitation personnel, physicians, and clerks.

The selection of services and clinical facilities for inclusion in the report was made on the basis of significance to program divisions of the

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Public Health Service and the Children's Bureau. Provision of chest X-ray for tuberculosis case finding ranked first among services reported. Topical fluoride application and diabetic group instruction were the two reportable services least frequently included in health programs.

In the selected community sanitation facilities and services category, there was slight difference between the 1952 information and that submitted for 1951.

For the first time this 1952 report carries information on the expenditures for public health services by units and the per capita income for each jurisdiction. The majority of the single county units and local health districts spent between \$0.50 and \$1.00 per capita; the largest proportion of city health departments, \$1.00 and \$1.50. No expenditure data were available for 9 percent of the reporting units.

## Pulmonary Fibrosis in Soft Coal Miners

An annotated bibliography on the entity recently described as soft coal pneumoconiosis

*Public Health Service Publication No. 352, Public Health Bibliography Series No. 11. By H. N. Doyle and T. H. Noehren. 59 pages. 25 cents.*

This bibliography contains abstracts of publications presenting information on a form of respiratory disability among soft coal miners believed to be unrelated to and different from silicosis. The disability is associated with prolonged inhalation of excessive amounts of coal dust. The incidence of the condition is particularly high in south Wales, and Great Britain has been making long-range comprehensive studies of the disease, which is gaining in medical significance. Various groups in this country are

finding these studies of particular interest.

The foreword of the bibliography describes the symptoms of the pulmonary ailment and explains the identification and nomenclature problems met in assembling the material for this publication. It points out that the compilers have chosen papers presenting a cross section of views on the subject and historical reviews, using as much as possible in their abstracting the language of the original authors.

The abstracts are chronologically arranged—the first, a paper published in 1834.

## Directory of State and Territorial Health Authorities, 1954

*Public Health Service Publication No. 75. Revised 1954. 73 pages. 30 cents.*

The 1954 revision of this directory was compiled from information reported to the Public Health Service as of May 1954 by State and Territorial health departments and by other State agencies participating in grant programs administered by the Public Health Service. Also included are agencies officially designated for the administration of the Water Pollution Control Act and State agencies other than health departments administering crippled children's services.

The listing of health department personnel is designed to reflect the organizational structure of State health departments and to delineate placement of responsibility for the major health functions. The principal organizational units and subordinate components are arranged alphabetically, according to the current departmental organization. The name of each health official appears opposite the unit which he

directs. If the name of the health unit is not self-explanatory, its major functions are noted.

The title and location of each State health department and the name of the health officer in charge is in a section preceding the organizational listing of officials for the individual States. The same information is shown for other State agencies designated to administer any pertinent program, such as mental hygiene.

Personnel of the Public Health Service in charge of functions closely associated with State health departments are listed in the appendix.

## Refuse Collection and Disposal

*A Bibliography—1951–1953*

*Public Health Service Publication No. 402. Public Health Bibliography Series No. 4 (Supplement A). 1954. 39 pages.*

The first volume of this bibliography, Public Health Service Publication No. 91, listed items which appeared during 1941 and 1950. The present supplement covers the years 1951–53.

The organization of the listings is substantially the same as in the first volume. The five main divisions of the bibliography are regulations, finances, storage, collection, and disposal. The sections on collection and disposal are subdivided further as in the earlier book.

This bibliography is intended as an aid in the exchange of information in research and operational phases of refuse-sanitation activities.

## Home Care of the Sick

*Public Health Service Publication No. 70, Health Information Series No. 21. Revised 1954. 2-fold leaflet. \$2.50 per 100.*

This leaflet contains general information on taking care of sick persons at home. It describes how to select a bed and other sick room

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equipment and gives similar patient-care instructions. The publication also outlines ways in which the attendant can be of help to the physician and suggests organizations and individuals who can give instructions in nursing care.

## Ringworm

*Public Health Service Publication No. 16, Health Information Series No. 6. Revised 1951. 1-fold leaflet. \$2.00 per 100.*

Ringworm is the common name for skin disease caused by a fungus growth. This leaflet describes four varieties and their effect upon the body. The most common is ringworm of the foot known as athlete's foot; the others are ringworm of the scalp, of the body, and of the nail.

The pamphlet tells of the symptoms of each, explains the danger of contagion, and suggests preventive measures. It advises seeking prompt medical attention to obtain proper treatment in each case.

## Proceedings of the Third Research Conference on Psychosurgery: Evaluation of Psychosurgery

*Public Health Service Publication No. 221, 1951. 173 pages; illustrated. \$1.00.*

The proceedings of the Third Research Conference of Psychosurgery held in New York City in 1951 under the auspices of the National Institute of Mental Health, Public Health Service, are presented in this publication. Most of the participants had also attended the two previous conferences: the first, held in 1949, on the criteria for selection of patients for psychosurgery; the second, in 1950, on the determination and measurement of the effects of psychosurgery.

The 1951 conference devoted its attention to a general evaluation of psychosurgery—its indications, methods, and results. The theme of the conference is developed by the speakers as they give their evaluation of psychosurgery in relation to drive, social service, reaction to painful stimuli, treatment of intractable pain, psychoneurosis, sex variants, psychopathic personality, and organic cases with emotional manifestations.

The publication also includes the report on techniques of psychosurgery given by the Committee on Surgery, a summary of the findings of the three conferences, and appendices.

## Pinworms

*Public Health Service Publication No. 168 (Health Information Series No. 51). Revised 1951. 1-fold leaflet. 5 cents. \$2.00 per 100.*

Pinworms are discussed from the viewpoint of their effect on persons, especially children in this recently revised leaflet. Symptoms and diagnosis of pinworm infection are described. Suggestions are offered for the control of pinworms and their eggs to prevent spread of infection within a household. Treatment by a physician is recommended for infected persons.

## Hospital Services— Pharmacy

*Prepared by the Division of Hospital Facilities, Public Health Service, 1951. 12 pages; illustrated.*

Suggested plans, equipment, supply lists, minimum standard, and organization for hospital pharmacies are presented as an integral part of the Public Health Service activities relating to the Hospital Survey and Construction Program.

Directed to architects, hospital administrators, pharmacists, and others concerned in hospital planning, this pamphlet is designed to help them understand the functions, layout, and equipment of hospital pharmacies.

The booklet is a compilation of articles prepared by the Division of Hospital Facilities which have appeared in other journals. The five sections of the booklet include suggested plans for hospital pharmacies; suggested equipment lists for hospital pharmacies; pharmacy supplies and pharmacological index; minimum standard for pharmacies in hospitals; and a discussion of the value of a hospital pharmacist.

## Home Sanitation

*Public Health Service Publication No. 231, Health Information Series No. 59. 2-fold leaflet. \$2.50 per 100.*

Home sanitation facts, important in the control of communicable diseases, are pointed out in this leaflet. It describes the precautions that should be taken to safeguard the water supply and gives advice on sewage and refuse disposal. Outlined are the best methods of combating flies and other insects and rats. It also gives information on proper light and ventilation, heating, plumbing, refrigeration, and accident prevention in the home.

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This section carries announcements of all new Public Health Service publications and of selected new publications on health topics prepared by other Federal Government agencies.

Publications for which prices are quoted are for sale by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. Orders should be accompanied by cash, check, or money order and should fully identify the publication. Public Health Service publications which do not carry price quotations, as well as single sample copies of those for which prices are shown, can be obtained without charge from the Public Inquiries Branch, Public Health Service, Washington 25, D. C.

The Public Health Service does not supply publications issued by other agencies.

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# Utilization of Local Health Centers in 25 North Carolina Counties.

By A. L. CHAPMAN, M.D., M.P.H., J. W. R. NORTON, M.D., M.P.H.,  
and EDWARD E. SPRINGBORN, B.C.S.

**H**ISTORICALLY, many local health departments have been poorly housed, frequently in the basements of county courthouses or city halls.

During World War II, under the provisions of the Lanham Act, modern health centers were built in various parts of the country near important military installations or defense plants. The passage of the Hospital Survey and Construction Act in 1946 made it possible for State hospital authorities to include participation in the construction of local health centers in their overall State hospital plan. Some States, among them North Carolina, have taken advantage of this opportunity and have participated in the construction of a significant number of modern local health centers. These centers have increased the stature of local health departments and have greatly improved the effectiveness and morale of the public health workers who use them.

Great care has been taken in planning and constructing these health centers. Their

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architectural and engineering features, with minor exceptions, reflect the high quality of architectural and engineering skills that contributed to their design and construction. It always is more difficult to modernize traditional public health programs than it is to adopt modern architectural designs in the construction of new health centers.

With this thought in mind, the authors queried a group of local health officers in North Carolina concerning certain phases of the programs that were being conducted in their local health centers. The staffs of the North Carolina State Board of Health and of the local health departments concerned cooperated in the study.

The sample selected consisted of 25 counties in which there had been erected local health centers with the aid of Federal, State, and local funds. These counties were:

Beaufort	Harnett	Rutherford
Burke	Hertford	Sampson
Caldwell	Martin	Scotland
Caswell	Moore	Stanly
Currituck	Northampton	Tyrrell
Dare	Person	Warren
Franklin	Robeson	Wilson
Edgecombe	Rockingham	
Halifax	Rowan	

These 25 county health departments comprise slightly more than one-third of the local health departments in the State. The list does not include the largest or the smallest health depart-

ments, nor does it constitute a cross section of all North Carolina county health departments.

The director of local health services of the North Carolina State Board of Health distributed a questionnaire to each of the 21 full-time local health officers and the 1 part-time health officer participating in the study. The questionnaire requested information about the community and specific data concerning clinic services, staff, and space utilization.

After ample time had passed to permit the local health officers to complete the questionnaire, a member of the staff of the Public Health Service regional office (Region III, Department of Health, Education, and Welfare) visited each of the 25 local health departments to interpret the meaning of any questions which were not clear. He also talked to various members of the local health department staffs to obtain their impression of their health center.

### Study Counties

From the data obtained it was possible to develop a composite picture of the 25 counties, their health centers, their services, their staffing patterns, and their problems. The "composite" county has a population of 38,137 persons, of whom 65 percent are white and 35 percent, non-white. Twenty-one percent of the population are urban, 79 percent, rural. The birth rate in these 25 counties was more than 3 times the death rate. In 1953 there were 1,071 births compared to 323 deaths. The annual per capita income was \$830. The annual per capita expenditure for public health was \$1.00. Slightly more than 0.1 percent of the annual per capita income was budgeted for public health purposes.

There were 18 practicing physicians and 7 dentists to serve the 38,137 persons in the composite county, a ratio of 1 physician to 2,119 persons and 1 dentist to 5,448 persons. The bed population ratio for the composite county was 2.66 beds per 1,000 population. All were general hospital beds. The utilization of beds was good, the average daily census being 72.5 percent of the total number of beds available.

Although the outpatient services offered by the 34 hospitals serving the 25 counties did not compare in quality or quantity to the services

available in most metropolitan areas, they exceeded in quantity the outpatient services usually provided in predominantly rural areas. Six of the 34 hospitals maintained outpatient services. These 6 hospitals served 24 percent of the total population of the 25 counties. The remaining 28 hospitals offered only inpatient and emergency services.

The average size of the 25 health centers was 3,410 square feet. The average cost, including equipment, was \$51,900, or 15.20 per square foot. The per capita cost of the health centers, including equipment was \$1.36.

### Clinic services in 25 North Carolina counties, 1949

Type of clinic	Health centers conducting clinics	Patient visits to—	
		All health centers	Health center clinics (percent)
Immunization.....	25	58, 513	45. 0
Food handlers.....	18	16, 256	12. 5
Tuberculosis.....	23	14, 714	11. 3
Venereal disease.....	21	12, 676	9. 7
Orthopedic.....	13	10, 250	7. 9
Maternal and child health (prenatal and well-baby).....	22	10, 172	7. 8
9th grade.....	4	2, 321	1. 8
Cancer.....	2	1, 690	1. 3
Preschool.....	7	1, 273	1. 0
Eye.....	11	1, 196	. 9
Diabetes.....	1	675	. 5
Ear.....	1	150	. 1
Heart.....	1	48	. 03
12th grade.....	1	45	. 03
Total.....	153	130, 012	-----

The staffs of the local health departments studied, although not up to the quantitative standards recommended by the American Public Health Association, were not out of line with the staffing patterns of other rural health departments. All but 1 of the 25 county health departments had a full-time health officer. The population ratios for other staff members were: public health nurses, 1/10,834; sanitarians, 1/27,241; and clerks, 1/25,090.

The 10 leading causes of death in North Carolina—heart disease, brain hemorrhage, cancer, accidents, certain diseases of early infancy, in-

fluenza and pneumonia, tuberculosis, nephritis, congenital malformations, and general arteriosclerosis—followed the pattern that has been developing throughout the United States for decades.

The types of clinics held in the 25 counties, the number of patient visits to the clinics, and the number of health centers conducting each type of clinic are shown in the accompanying table.

The average amount of space provided for each public health nurse was 84 square feet. The space allotted to sanitarians averaged slightly more—104 square feet. The public health nurses and sanitarians, it was estimated, spent an average of 1½ hours in the office each working day.

In the health centers, 4.8 percent of the space was occupied by laboratories that were maintained in 22 of the 25 health centers. The average number of square feet of laboratory space was 168. Only 1 of the 25 local health departments employed a full-time laboratory technician at the time of the study.

Each of the 25 health centers had waiting rooms that were used as meeting places. The average seating capacity was 55. All of the health officers reported that the waiting rooms were used in the evenings by various community groups. Typical of these groups were local boards of health, voluntary health associations, local Red Cross chapters, PTA groups, medical societies, boards of education, and farm groups.

Nine health centers had separate conference rooms averaging 170 square feet in size, with an average seating capacity of 13. Only 5 health centers had a library, but all made some provision for placing professional books and journals at the disposal of their staffs.

### Health Services

Certain characteristics of the health services provided in these 25 rural health centers lend themselves well to discussion; some present basic challenges to present concepts of providing rural public health service.

#### *Increasing Population*

The marked excess of births over deaths represents, in part at least, the success of past

and present public health services, improvements in medical and hospital care, and a better economy. It also portrays rather dramatically the current upsurge in our total population. This increase in population will continue to require an expansion in local public health services and an increase in the number of practicing private physicians.

#### *Financial Support*

The fact that little more than 0.1 percent of the per capita income of the population of these 25 counties is budgeted for local public health services should cause us to raise our professional eyebrows. Is this relatively small financial contribution for public health services commensurate with the public health needs of these rural people? Are we failing to dramatize to the taxpayer the value of and need for health services that still are not being provided? Or is it that we are failing to offer to people the types of health services they want and are willing to pay for?

#### *Physicians and Dentists*

The physician/population ratio of 1 physician to 2,119 persons, although not meeting the recommended physician/population ratio, is not atypical of most rural communities. It does bring out the fact that if the degenerative and malignant diseases—those causing long-term illnesses—continue to increase in our aging population, the “physician hunger” of rural populations will tend to increase rather than to decrease. Some alleviation of this situation might be obtained rather quickly by the wider use of paramedical personnel to extend the services of those practicing physicians who are now available.

The dentist/population ratio of 1 dentist to 5,448 persons represents a longtime and widespread problem throughout the United States. The only optimistic factor in this picture is the growing practice of fluoridating public water supplies and the topical application of fluorides to the teeth of children who do not have access to a fluoridated water supply. A 60-percent reduction in dental caries among a large segment of the child population would permit the present number of dentists to engage in more

preventive dentistry, for which they now have little time.

### *Hospital Beds*

The hospital bed/population ratio of 1 bed per 2.66 persons is partly the result of the State and federally aided program which assists communities to build new hospitals and to expand existing ones. The average daily census of 72.5 percent indicates that the bed supply is being well used. No beds for the chronically ill were reported in these 25 counties. Although the population approached 1 million people, there were no diagnostic centers listed as such in the 25 counties.

### *Outpatient Services*

The availability of outpatient services to 21 percent of the population in the study area is noteworthy because it far exceeds the availability of such services in many rural areas in other States.

The fact that outpatient services are available to 85 percent of the residents of large metropolitan areas and to only a small percentage of rural residents should concern all rural health officers. Are these outpatient services merely a metropolitan luxury or is there a genuine but unmet need for them in rural areas? Is the existence of ample outpatient services in metropolitan areas merely coincidental with the existence in such areas of more and larger hospitals? Can methods be developed whereby outpatient services can be provided economically to rural residents who need them and can qualify for them? Answers to these and to other similar questions must be found if we are to develop a comprehensive program for detecting the chronic diseases in their early stages and minimizing their complications.

### *Health Center Cost*

The per capita cost of the 25 health centers of \$1.36 was remarkably low for postwar construction. In North Carolina an upper limit has been placed on the size of all State-aided health centers, with graduated ceilings within certain population ranges. This action was deemed necessary to conserve the limited Federal and State funds available for construction of health centers in the State. It did have the

desirable effect of channeling a larger percentage of available funds into rural areas that were economically less well off than metropolitan areas. The arbitrary limitation on the size of health centers, however, had a tendency to keep the per capita cost low. Other communities intending to use the per capita cost of \$1.36 as a guide should take this factor into account. If there had been no ceiling on the size of the health centers, some undoubtedly would have been larger, which would have increased the per capita cost.

### *Staff/Population Ratios*

All but one of the 25 rural counties had a full-time health officer. This excellent coverage is typical of North Carolina, where local public health salaries are more realistic than those of many other States. It also reflects the policy of the State health department of placing the primary responsibility for local health protection on local health departments.

The ratio of 1 public health nurse to 10,831 persons, although short of national standards, is not low in comparison with other rural areas throughout the United States.

It does highlight the difficulty that will be encountered if local public health nurses are asked to provide bedside nursing services to the chronically ill. The public health nurses in these 25 counties are hard pressed now to maintain their daily work schedules. If bedside nursing is added to their many responsibilities, the need for additional nurses, as well as for more training for the nurses now on duty, will become demanding.

### *Leading Causes of Death*

The tabulation of the leading causes of death in North Carolina highlights the fact that undue emphasis may have been placed on the control of the infectious diseases after they had passed their peak incidence. It must be recognized, however, that maintaining the status quo will require the continuing expenditure of a significant amount of time and money. The cardiovascular diseases, cancer, brain hemorrhage, and accidents, which kill more than 75 percent of the persons who die each year, have not yet begun to be the subject of serious control efforts by the 25 local health departments



studied, although there are a few clinics for cancer, heart disease, and diabetes.

### *Clinic Services*

An analysis of the table in which the various clinic services are enumerated (page 102) shows that the five types of clinics that were conducted most frequently by county health departments—immunization, food handlers, tuberculosis, venereal disease, and maternal and child health—accounted for 112,361 of the total 130,012 patient visits, or 86.4 percent of the total. Only the tuberculosis clinics are aimed primarily at the control of diseases which are in the list of the 10 most important causes of death. Only one of the local health departments conducts a cardiac clinic. In 1953, this clinic reported 48 patient visits. Another health department conducted a diabetes clinic and maintained supervision of some 600 patients with diabetes, at the request of local private practicing physicians. Two health departments conducted cancer clinics.

### *Space Utilization*

The amount of space allotted to public health nurses and sanitarians, who, by their own estimate, spend an average of 1½ hours a day in the health center, gives food for thought. There is a definite trend toward group meetings and group education, as exemplified by weight control classes, patient education classes, and classes for expectant mothers (and even for expectant fathers). As long-term illnesses with their many complications gain in emphasis over acute infectious diseases, the multiplication of the duties of public health workers will demand more efficient methods of serving the public.

One way to permit scarce public health personnel to serve larger population groups is to bring people to health centers for group instruction rather than to send public health workers out to visit individuals in their homes. An example of this technique is the way practicing physicians have conditioned expectant mothers to go to hospitals for their deliveries rather than to have physicians waste precious time going to the home and waiting there for the infant to arrive. If this trend results in a need for more group instruction in health centers, additional

room will be needed in which these groups can meet.

One way to provide for additional space needs in health centers is to plan and construct them in such a way that extensions may be added with a minimum of alterations. Another possible alternative is to design the office space for public health nurses, sanitarians, and other field workers in such a way that it may be used for purposes of group instruction when it is not in use as office space. This latter alternative will require some pioneering on the part of health officers, architects, and engineers, but could well result in the more efficient utilization of health center space without imposing any real hardship on public health workers.

### *Laboratories*

Although 22 of the 25 health centers had laboratories, only 1 of the 25 health departments employed a full-time laboratory technician. Throughout the country there is a growing awareness of the need for diagnostic centers that can serve the needs of rural physicians. When laboratory services are not readily available, physicians often must rely on their clinical judgment to make difficult diagnoses or they must resort to costly and time-consuming expediences to have laboratory work done for their patients at some distant laboratory or medical center. As soon as public health and medical leaders in local communities are convinced of the need for adequate local laboratory services, local laboratories, now inactive, may be activated and communities without laboratories may decide to obtain them. The lack of outpatient hospital services in these areas emphasizes the urgent need for the development of these assisting laboratory services.

Research workers each year are developing new tests for the chronic degenerative and malignant diseases. These tests can be of great help to rural physicians in establishing the early diagnosis of many diseases that are characterized by long periods of latency. They can help physicians to diagnose such diseases as cancer, diabetes, blood dyscrasias, nephroses, and even rheumatoid arthritis, earlier and with greater accuracy. Certainly, the patient will benefit from such early diagnoses. It would seem logi-



cal, then, to look for the better staffing of local health center laboratories with well-trained technicians, who are masters of a wide variety of laboratory tests and are capable of operating the many laboratory instruments that are being made available for disease detection.

### *Meeting Space*

All of the health centers were provided with waiting rooms that can be used by community groups during the evening hours. This tendency to encourage community groups to use local health centers has proved to be an excellent way for health departments to provide a wider type of service and thereby earn community support for their programs. When local health departments resided in courthouse basements or attics, it was the rare individual indeed who knew where his local health department was located, the name of the local health officer, or what public health workers did to earn their money.

### *Construction Pointers*

When the Public Health Service regional representative visited each health center, he chatted with the health officer and with other members of the staff about the general "usability" of the health center and whether or not there were features about it that they would like to see changed. The uniform reply began with an expression of appreciation that they had gotten out of their antiquated quarters and into a modern health center in which they could work more efficiently and in which they could take pride. When pressed for their reaction to the design of their own health center, there were a few items they would like to see changed.

Eight health officers stated that storage space was inadequate. Eight mentioned that their health centers were not soundproof; in fact, privacy was almost completely lacking; voices carried clearly throughout the building and interfered with the conduct of interviews, conferences, and clinics. Seven said the heating system was not efficient; the ducts were placed at ceiling level, with the result that the temperature at floor level was too low. Radiant heating was not favored for southern climates. Six

suggested that cement blocks, spray painted, plus waterproofing with a silicone type of spray would be just as attractive as plastered walls and the cost of maintenance would be lower. Five claimed that flat roofs often leaked and tended to intensify the summer heat. Air conditioning, or at least better insulation, was strongly recommended.

Other less repetitive suggestions included the separation of one of the three clinic rooms from the other two rooms with a solid wall; not pouring concrete floors over plumbing installations; and not having rest rooms open directly into waiting rooms.

### **Summary and Conclusions**

By means of a questionnaire, supplemented by a personal visit, 25 local health officers and their staffs in North Carolina were queried about their health centers, their health services, and certain of their public health problems. The health workers uniformly expressed their appreciation for the benefits derived from being located in a modern health center.

The excellent programs conducted in these health centers were found to be oriented primarily to the control of the acute infections diseases and to the solution of maternal and child health problems. A start is now being made on programs designed to control the chronic non-infectious diseases and the accidents that are becoming the major causes of death in North Carolina.

The fact that only one full-time laboratory technician was employed by a local health department in the entire area, comprising 25 counties with a population of 953,425, is evidence of the sparsity of laboratory diagnostic services in these rural counties, which are deficient in hospital outpatient services.

This study suggests that, now that local health departments are being "disinterred" from their basement hideaways, continuing attention should be given to the planning and evaluation of the local health services provided in health centers and to their reorientation to current public health problems.

*Infantile diarrhea is a ubiquitous disease which has a high mortality rate, especially when it is unrecognized or treatment is delayed. The disease occurs not only as epidemics in nurseries but also as sporadic cases in the population.*

## A New Serotype of *Escherichia Coli* Associated With Infantile Diarrhea

By W. H. EWING, Ph.D., K. E. TANNER, B.S., and H. W. TATUM

**A** HITHERTO undescribed *Escherichia coli* serotype (O127:B8) associated with infantile diarrhea has been isolated from 121 stool cultures from 76 patients in 3 separate epidemics in Philadelphia, Pa., Cincinnati, Ohio, and Kamloops, B. C., and from cultures from sporadic cases of the disease in Mexico City. The results of bacteriological and serologic studies of these cultures and of related *E. coli* serotypes are reported.

For more than 40 years various investigators have studied *E. coli* cultures isolated from infantile gastroenteritis patients in which no recognized pathogens, such as members of the *Salmonella* or *Shigella* groups, were found. Results of earlier investigations (for references, see 14, 17, 1) were inconclusive because only biochemical methods were used in attempts to differentiate between *E. coli* cultures isolated from infants with diarrhea and cultures from normal infants. By themselves, biochemical

reactions proved inadequate for this purpose since, as is now known, different *E. coli* serotypes often give identical biochemical reactions. However, the extensive investigations of Kauffmann and his associates (15) established methods for definitive serologic typing of *E. coli* cultures and an antigenic schema in which the micro-organisms were classified.

Bray (2) and Bray and Beavan (3) apparently were the first to emphasize the association of a particular *E. coli* serotype with outbreaks of infantile diarrhea. The same type, now labeled O111:B4 (14), was isolated from 42 of 44 patients who had "infantile summer diarrhea." Independently, Varela and associates (25) in Mexico City isolated a bacterium which they named *Escherichia coli-gomez* from an infant who died of diarrhea. Later they isolated the same serotype from other patients. Varela found that the somatic antigens of *E. coli-gomez* were identical with those of *Salmonella adelaide* (O antigen 35) and he was able to employ *Salmonella* O35 antiserum in the identification of this particular *E. coli* serotype. Further studies on the antigenic relationship of *S. adelaide* and *E. coli-gomez*, as well as proof of the identity of the latter micro-organism and *E. coli* O111:B4, were given by Olarte and

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Varela (18). Confirmatory investigations were made by Kauffmann (16) and in this laboratory (unpublished data).

The second *E. coli* serotype which has assumed importance because of its association with epidemic infantile diarrhea was described by Giles and his co-workers (7). Kauffmann and Dupont (14) found that the  $\beta$  serotype of Giles and associates (7) belonged to *E. coli* O group 55 and contained a new B antigen, B5. Smith (21) gave detailed descriptions of the  $\alpha$  (O111:B4) and  $\beta$  (O55:B5) serotypes. Since 1915, cultures of *E. coli* O111:B4 and O55:B5 have been isolated during epidemics and from sporadic cases of infantile diarrhea in nearly all parts of the world.

Pertinent data regarding the two aforementioned serotypes are summarized in table 1. Also listed in the table are additional serotypes that were described in association with outbreaks of infantile diarrhea. As might be expected, epidemics have been reported in which *E. coli* serotypes O111:B4 and O55:B5 were not found and, in the examination of the *E. coli* flora from patients in such outbreaks, other serotypes common to the cases were reported. *E. coli* serotypes, other than those listed in table 1, also have been reported from outbreaks of infantile gastroenteritis, but further studies of their role in the disease are required. Cultures

of *E. coli* O124 have been isolated repeatedly from individual patients and from outbreaks of gastroenteritis and acute diarrhea in both children and adults (11). For additional information on the subject of *E. coli* serotypes associated with infantile diarrhea, readers are referred to the bibliographies of the papers cited above and reference 8. Persons interested in methods for isolation and preliminary identification of *E. coli* serotypes associated with infantile diarrhea are referred to Ewing and Edwards (13).

The cultures of the new *E. coli* serotype were received from several sources. During 1951 and 1952, 12 cultures from 3 sporadic cases in Mexico City were received from Jorge Olarte of the Hospital Infantil. These strains were studied in connection with a cooperative study of *E. coli* serotypes in sporadic cases of infantile gastroenteritis by Olarte and Ewing (unpublished data). In December 1953, 39 cultures from 9 patients in an epidemic in Philadelphia were sent by Dr. George M. Eisenberg to Dr. Edwin Neter, Buffalo, N. Y., who forwarded them to this laboratory, and 2 cultures from 2 patients were received from Dr. Merlin Cooper, Cincinnati, Ohio. During the first 4 months of 1954 Dr. Eisenberg sent 23 cultures from 17 additional patients and Dr. Cooper sent 40 cultures taken from 40 other patients during the

Table 1. Previously described *Escherichia coli* serotypes associated with infantile diarrhea

Antigens			Synonyms, culture numbers, and references
O	K	H	
111-----	B4-----	2, 12, 21, or non-motile (—).	<i>Bacterium coli napoli-tanum</i> . <i>E. coli-gomez</i> ----- <i>B. coli</i> $\alpha$ type----- Type D433----- <i>B. coli</i> , B. G. T.----- <i>B. coli</i> $\beta$ type-----
55-----	B5-----	2, 6, 7, or (—).	Varela, Aguirre, and Carille (25). Giles and Sangster (6). Taylor, Powell, and Wright (23). Rogers, Koegler, and Gerrard (20). Giles, Sangster, and Smith (7); Smith (21).
26-----	B6-----	11 or (—)	Biering-Sørensen, Knipschildt, and others, quoted by Ørskov (19). <i>E. coli</i> O26----- <i>E. coli</i> O26:P6----- Type ES93-----
112a, 112b-----	B13-----	18.	1411-50----- Ewing and Kauffmann (9).
112a, 112c-----	B11-----	(—)	<i>Shigella guanabara</i> ----- De Assis (5).
86a-----	B7-----	8, 9, 10, 11 or (—)	Charter and Taylor (4). Type E990-----
119-----	B14-----	6-----	Aberdeen 537-52----- Smith (22).
125-----	B15-----	19-----	Charter and Taylor (4).
126-----	B16-----	2-----	Canoui, Vincent----- Charter and Taylor (4). E611-----

Table 2. Biochemical reactions of *Escherichia coli* O127:B8 and related serotypes

Serotype	H antigens	Number of cultures examined	Glucose, lactose, mannitol	Adonitol, inositol	Sucrose	Saltin	Sorbitol	Indol MR	VP, citrate H <sub>2</sub> S	Motility
O127:B8 (4932-53, etc.)	(-)-----	107	AG	(-)	A, Ag (A)	(-)	<sup>1</sup> (-)	<sup>2</sup> (+)	(-)	(-)
O86:B7 (E990, etc.)	-, 8, 9, 10, or 11	13	AG	<sup>3</sup> (-)	V	V	<sup>4</sup> AG	(+)	(-)	(+/-)
O127a, 127b:B10 (2160-53, etc.)	4-----	9	AG	(-)	AG	AG	AG	(+)	(-)	(+)
O86a, 86b:B9 (5017-53)	Undescribed <sup>5</sup>	1	AG	(-)	(-)	AG	AG	(+)	(-)	(+)
O90-----	(-)-----	1	AG	<sup>3</sup> (-)	(-)	AG	AG	(+)	(-)	(-)

NOTE: AG, acid and gas production within 24 hours. A, acid only. (A) acid production delayed 48 hours or longer. V, variable, some strains positive, some negative.

-, test negative; +, test positive.

<sup>1</sup> 10 cultures produced acid from sorbitol after prolonged incubation (30 days).

<sup>2</sup> Indol production was weak in most strains; 72 or more hours' incubation was required.

<sup>3</sup> 2 cultures produced acid from adonitol. The O90 culture also fermented adonitol.

<sup>4</sup> 1 culture failed to ferment sorbitol.

<sup>5</sup> This serotype possessed an H antigen that differed from any known *E. coli* H antigen.

same outbreak. In February and April 1954, five cultures were received from Dr. E. T. Bynoe of the Laboratory of Hygiene, Ottawa, Canada. Dr. Bynoe had received the cultures from Dr. C. E. Dolman, Vancouver, B. C., who had received them from Dr. F. P. Sparks, pathologist at the Royal Island Hospital, Kamloops, B. C., where they had been isolated from 5 patients in an epidemic of 17 cases of acute gastroenteritis in infants during September 1953. In this epidemic 8 babies were seriously ill and the remainder were moderately ill, but there were no fatalities. The cases in the Philadelphia and Cincinnati outbreaks were reported to be relatively severe—3 deaths occurred in the Philadelphia epidemic and 2 deaths in the Cincinnati outbreak.

We have been informed by the above-mentioned individuals that *E. coli* serotype O127:B8 predominated in the stools during the acute stage of illness and that members of the *Salmonella* and *Shigella* groups were looked for but were not present. In some instances, serotype O127:B8 was the only coliform bacterium in the stool cultures. Cultures of this serotype were not recovered from well babies during any of the outbreaks and, to date, none has been received in this laboratory from sources other than diarrheal patients.

We understand that further data on the clinical

aspects of infantile diarrhea, the extent and nature of the outbreaks, and other details concerning the epidemics in Philadelphia and Cincinnati will be published by Eisenberg and Cooper in separate reports. The details of the epidemic in British Columbia probably will be published by the investigators of the outbreak.

The other two *E. coli* serotypes described for the first time in this paper are O86a, 86b:B9, and O127a, 127b:B10:H4. Only one strain (5017-53) of O86a, 86b:B9 was available for study. This was isolated from a normal individual who was a member of the staff of a Philadelphia hospital. Nine cultures (2160-53 and so on) of the other serotype (O127a, 127b:B10) were recovered during a survey from stools of pediatric patients who did not have diarrheal disease.

Included in these studies were several strains of the previously described serotype O86:B7, which had been isolated recently from the stools of infants who had diarrhea. The cultures were forwarded to this laboratory for typing. The type strain for this serotype was received in 1950 from Dr. Joan Taylor (4, 24).

### Biochemical Reactions

The biochemical reactions of cultures of *E. coli* serotypes O127:B8, O86:B7, and related

Table 3. The relationship of the O antigens of *Escherichia coli* serotypes O127:B8, O86:B7 and O group 90

O antigen suspensions (100° C., 1 hour)	<i>E. coli</i> O antisera								
	86			90			127		
	Unab- sorbed	Absorbed by—		Unab- sorbed	Absorbed by—		Unab- sorbed	Absorbed by—	
		127	90		127	86		86	90
86 (E990)-----	5, 120	1, 280	320	640	160	0	0	0	0
90-----	2, 560	640	0	5, 120	640	1, 280	1, 280	640	0
127 (4932-53)-----	1, 280	0	0	640	0	640	20, 480	20, 480	1, 280

<sup>1</sup> Agglutination titers are expressed as the reciprocal of the highest dilution that gave strong agglutination.

cultures are listed in table 2. The reactions of the 121 strains of serotype O127:B8—which were remarkably uniform when the geographic locations of the sources were considered—were as follows: Glucose, lactose, and mannitol were fermented with gas production within 24 hours' incubation by all cultures. All cultures fermented sucrose, but a few strains required 48 hours' incubation for the reaction to appear, and some strains did not produce gas from this substrate. Salicin, adonitol, and inositol were not attacked during 30 days' incubation. The majority of strains did not ferment sorbitol within 30 days, but 10 cultures produced acid from this carbohydrate after 30 days' incubation. Hydrogen sulfide was not detected in triple sugar iron agar, acetylmethylcarbinol was not produced, and urea was not hydrolyzed. All strains failed to grow on Simmons' citrate agar, and all were nonmotile. The methyl red test was positive. All cultures produced indole but required 72 hours' incubation or

longer to produce detectable amounts of indole from 2 percent Bacto peptone water (Kovac's reagent).

Serologic Studies

The methods used for serologic studies and for anti-serum production were similar to those previously reported (9, 10, 12) and were based upon methods advocated by Kauffmann (15).

Relationships of the O Antigens

Heated broth antigens of culture 4932-53 and other strains of the new serotype referred to as O127:B8 were tested in antisera for all of the 126 known *E. coli* O antigen groups in dilution of 1:100. Positive agglutination reactions were obtained in antisera for O groups 86 and 90; all other tests were negative. Upon titration of O antigen suspensions in these two O antisera there was some variation in the titers to which the strains were agglutinated. The

Table 4. The interrelationship of the O antigens of *Escherichia coli* cultures of O groups 86, 90, and 127

O antigen suspensions (100° C., 1 hour)	<i>E. coli</i> O antisera (unabsorbed)				
	86a (E990)	90	127a (4932-53)	127a, 127b (2160-53)	86a, 86b (5017-53)
86a (E990)-----	5, 120	640	0	5, 120	5, 120
86a, 86b (5017-53)-----	20, 480	640	0	10, 240	20, 480
90-----	2, 560	5, 120	1, 280	5, 120	160
127a (4932-53)-----	1, 280	640	20, 480	5, 120	0
127a, 127b (2160-53)-----	10, 240	1, 280	10, 210	20, 480	640

average titer was 1:1,280 in O86 antiserum and 1:640 in O90 antiserum (tables 3 and 4). When heated broth antigens prepared with cultures of *E. coli* O groups 86 and 90 were tested in O antisera prepared with culture 4932-53 and identical strains, O group 86 cultures failed to react, whereas the antigens for O group 90 were agglutinated in dilutions of 1:640 to 1:1,280 (tables 3 and 4). The results of reciprocal agglutinin absorption tests with these O antisera (table 3) indicated that the O antigens of serotype O127:B8 cultures were related unilaterally to those of O group 86; whereas the relationship to O group 90 was bilateral or reciprocal. However, since the O antigens of serotype O127:B8 strains were not identical with those of *E. coli* O group 90, it was decided to assign these cultures to a new *E. coli* O antigen group, namely, O127. This decision was made after consultation with Kauffmann and Ørskov of the International Salmonella and Escherichia Center, Copenhagen, Denmark.

During the study of the O antigens of cultures of *E. coli* O127:B8, a number of other cultures related to *E. coli* O groups 86 and 90 were reinvestigated. The results of agglutination tests in unabsorbed O antisera (table 4) indicated the interrelationship of this group of cultures. Reciprocal agglutinin absorption tests indicated that the O antigens of cultures 2160-53, 2210-53, and others like these, were identical. Similar absorption tests (table 5) also showed that the O antigens of O group 127 strains and culture 2160-53 were closely related but not identical. The O antigens of these two sero-

**Table 5. Relationship of the O antigens of *Escherichia coli* serotypes O127a:B8 and O127a, 127b:B10**

O antigen suspensions (100° C., 1 hour)	O antisera			
	127a (4932-53)		127a, 127b (2160-53)	
	Unabsorbed	Absorbed by 127a, 127b	Unabsorbed	Absorbed by 127a
127a (4932-53)	20, 480	0	5, 120	0
127a, 127b (2160-53)	20, 480	0	20, 480	10, 240

**Table 6. O antigenic relationship of *Escherichia coli* serotypes O86a:B7 and O86a, 86b:B9**

O antigen suspensions (100° C., 1 hour)	O antisera			
	86a		86a, 86b	
	Unabsorbed	Absorbed by 86a, 86b	Unabsorbed	Absorbed by 86a
86a (2805-52)	5, 120	0	5, 120	0
86a, 86b (5017-53)	20, 480	0	20, 480	5, 120

types may be expressed by the use of arbitrary formulas, as follows:

4932-53 ----- O127a  
2160-53 ----- O127a, 127b

It should be mentioned that all of the 121 cultures associated with sporadic cases and with epidemics of infantile diarrhea belonged to O group 127a, whereas the 9 cultures like 2160-53 were O group 127a, 127b. The former group of strains were nonmotile and somewhat less active as regards their biochemical reactions, and were further characterized by a distinct B antigen, as will be shown. The nine cultures of the latter group were motile (H antigen 4).

The relationships of the O antigens of *E. coli* O86a and O86a, 86b (5017-53) are given in table 6. The relationship of these two serotypes to each other was analogous to that noted between serotypes of O group 127, mentioned above. The H antigen of culture 5017-53 was not agglutinated by H antisera prepared with the 33 known *E. coli* H antigens. Thus, the H antigen of this serotype represented a new, unnumbered *E. coli* H antigen.

The results of reciprocal agglutinin absorption tests indicated that the O antigens of *E. coli* serotypes O86a, 86b, and O127a, 127b were related but not identical. A strong specific factor remained in each antiserum for the homologous serotype following reciprocal absorptions.

#### *B Antigenic Relationships*

When cultures of the *E. coli* serotype referred to as O127:B8 first were received in the laboratory for identification, they were tested on slides

**Table 7. The relationship of the K antigens of certain *Escherichia coli* serotypes**

K antigen suspensions	<i>E. coli</i> K (B) anti-serums				
	B2	B7	B8	B10	B9
B2 (O8).....	320	0	0	80	0
B7 (O86).....	40	320	0	40	40
B8 (O127).....	40	0	320	80	0
B10 (O127a, 127b).....	0	0	0	640	0
B9 (O86a, O86b).....	0	0	0	0	320
K-O90 <sup>1</sup> .....	0	40	0	80	0

<sup>1</sup> The K antigen of the *E. coli* O90 strain was undetermined.

with O and OB antiserum for the *E. coli* serotypes that have been associated with cases of epidemic infantile diarrhea. Living suspensions of these cultures were not agglutinated by any antiserum except that for O86, in which most of the living suspensions reacted to a greater or lesser extent. Living suspensions did not react in B7 (O86:B7) antiserum. The reason for this apparent discrepancy is believed to lie in the fact that the living O127:B8 strains were not entirely O inagglutinable and therefore reacted in the higher titered O86 antiserum and failed to react in the O86:B7 antiserum which had a relatively lower O titer. Heated broth antigens of several O127:B8 strains later were tested in O86:B7 antiserum and it was found that they reacted in dilutions of 1:160.

Living suspensions of the new *E. coli* serotype then were tested on slides in antisera prepared with all of the 61 known *E. coli* K antigens. Positive agglutination tests were obtained only in antiserum for B antigen 2 (O8:B2). In subsequent slide tests it was found that living suspensions of all 121 strains of serotype 127:B8 reacted in B2 antiserum. When K antigens prepared from representative strains of this serotype were titrated in serial dilutions of B2 antisera, all strains tested reacted in this antiserum at 1:40 but not in higher dilutions (table 7). A K antigen suspension made with a culture of *E. coli* O8:B2 did not react in OB antiserum prepared with serotype O127:B8.

The results of reciprocal agglutinin absorption tests (table 8), using living suspensions, confirmed the individuality and specificity of

thermolabile somatic antigens B2 and B8. That the thermolabile somatic antigen of *E. coli* O127:B8 was in fact a B antigen was shown by absorption tests in which all agglutinins were removed from OB antiserum for O127:B8 when the antiserum was treated with a heated (100° C., 1 hour) suspension of the homologous culture (table 8). The antibody binding power of the thermolabile somatic antigen was not destroyed by heat at 100° C. Since this B antigen was not identical with, or significantly related to, any described *E. coli* K antigen, it was designated "B5."

Two other undescribed B antigens were characterized during the examination of cultures related to *E. coli* O groups 86, 90, and 127. One of these was found in culture 5017-53 (O86a, 86b) and the other occurred in the nine cultures that belonged to O group 127a, 127b. The B antigens of these cultures were not related significantly to any known *E. coli* K antigen or to those described herein (table 7). The designation B9 was assigned to the thermolabile somatic antigen of culture 5017-53 and the comparable antigen of culture 2160-53 was designated B10. That these two thermolabile somatic antigens, B9 and B10, actually were B antigens was demonstrated by appropriate absorption tests.

It was possible to prepare pure B7 antiserum by absorption of O86a:B7 antiserum with unheated or with heated suspensions of culture 5017-53 (O86a, 86b:B9). Similarly, a pure B8 antiserum was prepared by absorption of O127a:B8 antiserum with either heated or unheated suspensions of serotype O127a, 127b:B10. These absorbed antisera agglutinated living cultures of the respective serotypes but did not react with heated suspension.

### Summary

The biochemical and serologic reactions of 121 cultures of the new *Escherichia coli* serotype O127:B8 associated with infantile diarrhea are described. The cultures of the new serotype were isolated from cases of infantile diarrhea in three separate epidemics in Philadelphia, Pa., Cincinnati, Ohio, and Kamloops, B. C., and from sporadic cases of this disease in Mexico City.

Table 8. Comparison of the B antigens of *Escherichia coli* serotypes O127a:B8 and O8:B2

Antigen suspensions	B antisera				
	B2		B8		
	Unabsorbed	Absorbed by O127:B8 (unheated, forma- linized)	Unabsorbed	Absorbed by—	
				O8:B2 (unheated, forma- linized)	O127:B8 (100° C., 1 hour)
<i>E. coli</i> O8:B2, unheated.....	320	320	0	0	-----
100° C., 1 hour.....	2, 560	2, 560	0	0	-----
<i>E. coli</i> O127a:B8, unheated.....	40	0	160	160	0
100° C., 1 hour.....	0	0	2, 560	-----	0

The O antigens of the new serotype constitute a new *E. coli* O antigen group, 127, and the thermolabile somatic antigen of the cultures was found to be an undescribed B antigen which was designated B8. All of the 121 strains of serotype O127:B8 were nonmotile.

Two other *E. coli* serotypes, O86a, 86b:B9 and O127a, 127b:B10:H4, also are described. These two serotypes were isolated from normal individuals.

The O, B, and H antigens of the new *E. coli* serotypes are compared with those of previously described *E. coli* antigens and details of the relationships noted are presented.

• • •

*Since this paper was written, and up to October 1, 1954, we have received 29 additional cultures of E. coli O127:B8, representing 43 additional cases of infantile diarrhea from outbreaks in Albany, N. Y., New Jersey, and sporadic cases in California and Chicago, Ill.*

#### REFERENCES

- (1) Braun, O. H.: Das Problem der Pathogenität von *Escherichia coli* in Säuglingsalter. Heidelberg, Germany, Springer-Verlag, 1953.
- (2) Bray, J.: Isolation of antigenically homogenous strains of *Bact. coli* neapolitanum from summer diarrhea of infants. *J. Path. & Bact.* 47: 239-247 (1945).
- (3) Bray, J., and Beavan, T. E. D.: Slide agglutination of *Bacterium coli* var. neapolitanum in summer diarrhea. *J. Path. & Bact.* 60: 395-401 (1948).
- (4) Charter, R. E., and Taylor, J.: Cultural and serological reactions of strains of *Bact. coli* isolated from babies. *J. Path. & Bact.* 64: 729-734 (1952).
- (5) De Assis, A.: *Shigella guanabara*, tipo serológico destacado do grupo do *B. ceylonensis-dispar*. *O Hospital* 33: 505-518 (1948).
- (6) Giles, C., and Sangster, G.: Outbreak of infantile gastro-enteritis in Aberdeen: Association of a special type of *Bact. coli* with infection. *J. Hyg.* 46: 1-9 (1948).
- (7) Giles, C., Sangster, G., and Smith, J.: Epidemic gastro-enteritis in infants in Aberdeen during 1947. *Arch. Dis. Child.* 24: 45-53 (1949).
- (8) Edwards, P. R., and Ewing, W. H.: The status of serologic typing in the family Enterobacteriaceae. *Am. J. Pub. Health* 42: 665-671 (1952).
- (9) Ewing, W. H., and Kauffmann, F.: A new coli O antigen group. *Pub. Health Rep.* 65: 1341-1343 (1950).
- (10) Ewing, W. H., Hucks, M. C., and Taylor, M. W.: Interrelationship of certain *Shigella* and *Escherichia* cultures. *J. Bact.* 63: 319-325 (1952).
- (11) Ewing, W. H.: Serological relationships between *Shigella* and coliform cultures. *J. Bact.* 66: 333-340 (1953).
- (12) Ewing, W. H., Tanner, K. E., and Dennard, D. A.: The Providence group: An intermediate group of enteric bacteria. *J. Infect. Dis.* 94: 134-140 (1954).
- (13) Ewing, W. H., and Edwards, P. R.: Isolation and preliminary identification of *Escherichia coli* serotypes associated with cases of epidemic diarrhea of the newborn. *Pub. Health Lab.* 12: 75-81 (1954).
- (14) Kauffmann, F., and Dupont, A.: *Escherichia* strains from infantile epidemic gastroenteritis. *Acta path. et microbiol. Scandinav.* 27: 552-564 (1951).



- (15) Kauffmann, F.: Enterobacteriaceae. Copenhagen, Denmark, Ejnar Munksgaard, 1951.
- (16) Kauffmann, F.: On antigenic relationships between *Escherichia* strains from infantile enteritis and *Salmonella* or Arizona strains. Acta path. et microbiol. Scandnav. 31: 355-258 (1952).
- (17) Neter, E., Webb, C. R., Shumway, C. N., and Murdock, M. R.: Study on etiology, epidemiology, and antibiotic therapy of infantile diarrhea, with particular reference to certain serotypes of *Escherichia coli*. Am. J. Pub. Health 41: 1490-1496 (1951).
- (18) Olarte, J., and Varela, G.: A complete somatic antigen common to *Salmonella adelaide*, *Escherichia coli-gomez*, and *Escherichia coli* O111:B4. J. Lab. Clin. Med. 40: 252-254 (1952).
- (19) Orskov, F.: On the occurrence of *E. coli* belonging to O-group 26 in cases of infantile diarrhoea and white scours. Acta path. et microbiol. Scandnav. 29: 373-378 (1951).
- (20) Rogers, K. B., Koezler, S. J., and Gerrard, J.: Chloramphenicol in treatment of infantile gastroenteritis. Brit. Med. J. 2: 1501-1504 (1949).
- (21) Smith, J.: The association of certain types ( $\alpha$  and  $\beta$ ) of *Bact. coli* with infantile gastroenteritis. J. Hyg. 47: 221-226 (1949).
- (22) Smith, J.: The association of serological types of *Bacterium coli* with infantile gastroenteritis. J. Path. & Bact. 65: 503-511 (1953).
- (23) Taylor, J., Powell, B. W., and Wright, J.: Infantile diarrhoea and vomiting. A clinical and bacteriological investigation. Brit. Med. J. 2: 117-141 (1949).
- (24) Taylor, J., and Charter, R. E.: The isolation of serological types of *Bact. coli* in two residential nurseries and their relationship to infantile gastroenteritis. J. Path. & Bact. 64: 715-728 (1952).
- (25) Varela, G., Aguirre, A., and Carille, J.: *Escherichia coli-gomez*, nueva especie aislada de un caso mortal de diarrea. Bol. méd. Hosp. Inf., Méx. 3: 3-7 (1946).

## technical publications

### Distribution of Health Services in the Structure of State Government, 1950

*Public Health Service Publication No. 184, parts 1-4, 1954. By Joseph W. Mountain, Aaron W. Christensen, Evelyn Flook, Edward L. Mintz, Rubye F. Mullins, and Georgie B. Druzina. 366 pages; tables. \$1.90.*

Distribution of Health Services in the Structure of State Government, a revision of Public Health Bulletin No. 184, third edition, 1940, is now available in a single volume. The four parts—Part 1. Administrative Provisions for State Health Services; Part 2. General Services and Construction of Facilities for State Health Programs; Part 3. Personnel Health Services Provided by State Government; Part 4. Environmental Health and Safety Services Provided by State Government—each released under separate cover as the data were prepared, have been bound for the convenience of the reader in a

single publication, with a table of contents added. No revisions have been made in the material as previously presented in the separate parts.

### State Tuberculosis Control Programs As Planned for Fiscal Years 1954 and 1955

*Public Health Service Publication No. 396. 1954. 24 pages.*

State program plans for tuberculosis control, fiscal years 1954 and 1955, are presented in abstract form in this booklet. Submission to the Public Health Service of a plan of operations for carrying out public health programs is required of all State agencies participating in Federal grants-in-aid for health work.

The abstracts reflect in concise form the proposed elements as described by the responsible State officials. No attempt was made to evaluate program content, and clarification of descriptions, interpreta-

tions, and editorial changes were kept to a minimum.

The booklet also presents a summary of the needs and problems significant to the tuberculosis control program as expressed by State program directors.

In addition, selected administrative information related to each State's tuberculosis control program is shown in tabular form. These data include placement of responsibility for tuberculosis control in the health department and staff assigned to the program.

This section carries announcements of all new Public Health Service publications and of selected new publications on health topics prepared by other Federal Government agencies.

Publications for which prices are quoted are for sale by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. Orders should be accompanied by cash, check, or money order and should fully identify the publication. Public Health Service publications which do not carry price quotations, as well as single sample copies of those for which prices are shown, can be obtained without charge from the Public Inquiries Branch, Public Health Service, Washington 25, D. C.

The Public Health Service does not supply publications issued by other agencies.



# The Practice of Public Health, 1954

“**A**T THE BEGINNING of our school year at Harvard, I usually walk silently into the classroom and write on the blackboard the question, ‘What do the people want done about their health?’ ‘The people must be part of our health team if our work is to be effective. . . .

“Learning people’s attitudes about health; having the value of their advice in planning; and giving them the opportunity to participate in working out their own health programs—this is helping people to help themselves, which has become such an important watchword in international health work. This is part of community organization and each of us in public health can understand its principles sufficiently well to make our work more productive.”

HUGH R. LEAVELL, M.D., DR.P.H.

*President, American Public Health Association,  
1953-54.*

*Presidential address to the  
American Public Health Association at the  
Eighty-second annual meeting in Buffalo, N. Y.  
October 12, 1954.*

a topical  
and selected  
report of the  
82d

annual meeting  
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AMERICAN  
PUBLIC  
HEALTH  
ASSOCIATION

and related  
organizations  
held at  
Buffalo, N. Y.  
Oct. 11-15, 1954

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tion was the fact that the project was initiated by physicians—a group to which the community conceded a right to make decisions on health.

Before the action could be completed, he said, three stages in a pattern of social relationships had to be fulfilled—initiation, legitimization (the authority to justify action), and execution. There is sufficient regularity in human community behavior, he continued, to permit the trial in comparable community projects of the sociologic generalizations drawn from this situation.

## Public Health Field Needs The Social Sciences

*Can formal surveys provide a better understanding of community organization and function than daily experience has already given the regional health officer, the Community Chest executive, or the local politician?*

*Specifically, can the community self-survey technique, developed by social scientists, serve as an effective instrument for public health action?*

These questions were posed by Odln W. Anderson, Ph.D., research director of the Health Information Foundation, New York City, in the course of his remarks opening a symposium on community self-surveys in health. He gave no answers, but said that he trusted his listeners would have enough material to form their own opinions after all the talks were given.

During the sanitation and communicable disease stages, public health programs were rooted in the laboratory sciences, Anderson continued. But vital public health is now concerned with people and communities and is looking to the social sciences for assistance in the promotion, organization, and administration of its programs.

### Public Opinion

It is in social and community organizations that health programs are

planned and promoted, he said, and it is there that they succeed or fail. Unless the programs are firmly supported by the general public, Anderson warned, they have little chance of success.

Physicians, nurses, sanitarians, health educators, and other specialists in the field know quite well the conditions which constitute health problems in a given area, he said, but they sometimes find that citizens of the community don't accept their conclusions.

There is always a lag between public health knowledge and its application, according to Anderson. He suggested that social sciences might shorten the present gap by providing techniques for the collection of data on social and community organizations.

### Other Areas

Cost and utilization factors and legal problems associated with the planning and administrative phases of health programs are another area to which, Anderson believes, social science methods might be applied.

He also suggested that social science principles and techniques could be used in the study of the various conditions under which disease arises. In every time and place, he said, there is a disease pattern related in some way to such social conditions as the state of the arts and sciences, the level of living, composition of the population, and many other factors.

He concluded that, before the social scientist and the public health specialist can unite for effective work, each must learn more about the other's field.

## Finds Experts Could Aid Community Self-Study

Communities cannot isolate themselves from resources and expert guidance available to them from beyond community borders and still do an effective job in study and action

problems in health practice, according to Floyd Hunter, Ph.D., associate professor at the School of Social Work, University of North Carolina.

Dr. Hunter was a member of the university's team which appraised the Salem, Mass., self-study. The 2-year appraisal, characterized by Hunter as a study of a self-study, was restricted to observing the social and power factors in the community organization and in the functioning of the self-survey.

The research team, Hunter said, found the community no exception to the general pattern of social stratification. Salem's study consisted of piecing together the opinions of a group of health agency executives related to their conceptions of health needs, he added.

Hunter also reported:

Salem did a complete study of health needs. It did not seek outside help in completing its study, nor did it call upon the observers for help.

If the community had had good outside help, it might have received more for its money.

Salem went about solving its health problems in a manner that conformed to its general pattern of problem-solving. Community functions in Salem are delegated to specific functioning groups, and, consequently, health organizations and their leaders had a greater interest in promoting and extending a health study than other community groups.

A small proportion of the total population was involved in the study, which was conducted by committee, behind closed doors, with public participation virtually limited to hearing the conclusions.

The formation of the self-study committee was subject to the general economic, political, and social processes that bear upon the local parent sponsoring body of the study, the community council.

Matters of communitywide policy in relation to health problems inevitably involved the community power structure. This was demonstrated in the relationship estab-

lished between the upper echelons of the power structure, mainly composed of industrial and commercial leaders, and the leadership of the committee, chiefly professional health workers and subleaders in the community. Committee members generally followed traditional role expectations.

A few leaders emerged in the survey process who were primarily instrumental in furthering the self-study. The health agencies and the members of the study committee were affected by the restrictions and limitations of the traditional social arrangements in the community. Salem's ethnic pattern showed a dominant minority, followed by five other minorities. The lack of social communicability between these conflicting groups has an important bearing on solving health problems.

There was no going into the details of agency operations, personnel practices, and the like, no depth in the examination of agency services or resources.

After all the pains and processes of study were finished, a health center was realized. Of several recommendations made by the self-study committee, the health center recommendation was the only one acted upon immediately. This immediacy of action reflected the interest of the health director and a few people close to him.

## Alabama Study Action Came From One Group

Citizen participation in selecting health problems that need study is a device of crucial importance, said Solon Kimball, Ph.D., professor of education, Columbia University Teachers College.

This type of action, he explained, provides a mandate without which public health officers are less inclined to enter fields of possible controversy.

When people have an opportunity to examine conditions in their communities, proposals for improvement

carry widespread support, according to Kimball, who illustrated his discussion by showing application of the self-survey technique in a study of health conditions in Talladega, Ala. The study was made from 1951 to 1953 by residents of the city with the aid of a grant from the University of Alabama.

### *Citizen Participation*

All decisions on scope, organization, and policy were placed in the hands of the community, Kimball reported. This arrangement, he said, pleased both the residents of the town, who were wary of probing outsiders, and the social scientists, who wanted to watch a community process unfold with minimum external disturbance.

Approval of the survey was readily secured from the county medical association and the board of public health, he continued. The chamber of commerce, which had initiated the study, then arranged for a series of public meetings and invited the principal institutions and industries and each civic, social, and religious group to send two delegates.

At these meetings, the citizens of Talladega elected a group to direct the survey and suggested health problems for this organization's study. Kimball said that some of the recommended items were garbage collection, city water fluoridation, school performance and health, Negro housing, stream pollution, and rural health. The newly elected officers based their program on these and other citizen recommendations.

### *University Observers*

A team of social scientists from the university, Kimball continued, remained in the community as consultants and observers for the 2-year study period. Their major working responsibility, he reported, was to give technical assistance in constructing a communitywide questionnaire and in the use of sampling techniques.

The university team, he said,

avoided policymaking and leadership, but they sometimes raised questions or offered suggestions for smoother operation. Although community representatives were free to accept or reject their ideas, the social scientists, according to Kimball, took an active part in the project not only by providing technical skills but also by acting in the important role of catalysts.

Furthermore, he continued, they did so without impairing the basic responsibility of the community for its actions. When a community self-survey is well organized, he said, it can furnish enormously increased opportunities for the individual participation which is vital to the success of any group activity. The social scientist, Kimball remarked, may be able to further the process by stimulating isolated individuals and groups to work together on problems of mutual concern.

Pointing out that the town had 3 distinct social segments, he said that all of the planning and most of the activity were centered within the top third of the town's population although most of the problems considered were of equal or greater importance to the other two-thirds. The question of equalizing participation through all social classes remains unanswered.

## Can Change Attitudes, End Misunderstanding

Self-surveys are designed to transform individual goals to community goals by stimulating personal and community participation in public health activities, stated Charles P. Murphy, research associate, Health Information Foundation, New York City. Such surveys also provide the health worker with a means of testing the degree to which health programs are understood, appreciated, and utilized, Murphy said.

Conflicting attitudes toward common problems change when persons from different parts of the community work together and learn to

understand each other and the causes of their misunderstandings, Murphy stated. Also, he said, persons who lack the initiative to work alone are usually able to take constructive action on community problems when they serve on committees and work with groups.

Health action programs are most successful when they are initiated through existing institutions and in accordance with usual community procedures, Murphy said. The self-survey technique encourages acceptance of programs which run counter to community traditions and uses the desire and ability of members of

a community to work together to solve their own problems. Timing of the program and selection of sponsors acceptable to the community are important, Murphy emphasized.

The probability of public support of a program is increased by self-surveys, Murphy concluded. Large segments of the community become personally involved and personally interested during the initiation, fact-finding, and planning stages of a public health program and develop a sense of personal responsibility toward the situation being studied, he said.

Summing up the opening discussion, Abel Wolman, Dr. Eng., professor of sanitary engineering at Johns Hopkins University, attributed the process of suburbanization to uncritical developments of transit facilities, easy credit terms for automobile purchases, and the rise in population. At the root of the urban dilemma, he said, was the fact that private individual decisions conflict with the best of community plans.

The consequence of the failure of urban communities to plan for growth, Wolman stated, is the cultural and physical deterioration of the countryside.

Meanwhile, he said, the central core of the city, still holding the major share of the population, has its own drastic needs of housing, schooling, medical care, traffic facilities, accident prevention, and sanitation. These needs it must attempt to satisfy while its wealthiest and most influential community leaders desert the towns for rural retreats.

The second session of the symposium discussed remedial action for the cities which, said Victor Jones, Ph.D., professor of government at Wesleyan University, pursue three general policies:

1. Do nothing.
2. Organize each interest in a separate unit: water, school, sewerage, housing, traffic, and so on—a policy having the advantage of being an easy course but replacing territorial disintegration with functional disintegration.
3. Organize a regional government to weigh needs and resources and to share responsibilities with local units of government.

Jones warned that a regional authority, if it is not subject to popular control, may be unresponsive to popular needs and desires, and he suggested that a county government, properly organized, can do anything a regional authority can do. He also supported the proposition that services necessary for the well-being of the whole community need not be self-supporting on a fee, license, or special tax basis, but would warrant

## Suburbia and Public Health

"Horse and buggy public health is not good enough to deal with the problems of suburbia," APHA President Hugh Leavell, M.D., Dr.P.H., said in concluding two half-day sessions participated in by public administrators, political scientists, historians, and business representatives, as well as public health leaders, on the topic, "The Impact of Suburbanization on Public Health."

"There must be understanding of the 'frontier fantasy' and of the objectives people have in going to live in suburban areas," Leavell said. "As they become migratory workers going into Central City in the morning and returning to their bedroom communities in the evening, we must understand the resulting changes in family structure and function and consider how our health advisory functions need to be adapted to the problem," he said.

"We need a child's bill of rights as well as a GI bill of rights, since it seems likely that the child suffers more from being in suburbia than does his mother or father who usually have had the advantage of being brought up in areas where there were suitable cross-cultural influences and

where they experienced the interdependency and neighborliness of a balanced community," Leavell concluded.

At the opening session, members of the APHA General Program Committee reported from a specially prepared analysis of the problem. Key facts given were:

The greater part of the population in this country is established in 168 "urban sprawl" areas. These areas occupy 7 percent of the land in the Nation. Suburban areas are growing in population at a rate greater than the central cities. But the central cities are still growing.

The "spill" of urban population has produced a complex web of interrelated issues affecting schools, mental health, drainage, water supply, transportation, hospital facilities, and sewage and garbage disposal.

The 77 standard metropolitan areas which have cities of 50,000 to 100,000 include almost 5,000 independent governmental jurisdictions. There are 16,210 units of local government in the 168 areas. Eleven have more than 250 units each.

financial support out of general tax revenues.

In suggesting guidelines for urban management, Leona Baumgartner, M.D., Ph.D., commissioner of health, New York City, observed that economies may be realized by rehabilitating the neighborhoods and lives of that 6 percent of the so-called problem families which consume more than half of public welfare services.

Dwight Metzler, chief engineer, Kansas State Board of Health, recommended economies by organizing sanitary districts for management of water and sewer facilities.

Leroy Elwell of the Pennsylvania Economy League described the operation of the Pittsburgh-Allegheny County plan.

Paul Lemkau, M.D., and Ruth Freeman, Ed.D., of the Johns Hopkins School of Hygiene and Public Health, discussed the sociological and psychological implications of

stratifying American neighborhoods according to income level, occupation, or ancestry.

Howard Ennes, M.P.H., director, bureau of public health, Equitable Life Assurance Society, chaired the panel.

Participants included, in addition to those named above:

Marvin Rapp, New York State College for Teachers, Buffalo; A. Holly Patterson, LL.B., County Executive, Nassau County, Mineola, N. Y.; Dorothy Nyswander, Ph.D., University of California School of Public Health; Granville W. Larimore, M.D., M.P.H., New York State Department of Health; Berwyn F. Mattison, M.D., commissioner of health, Erie County Health Department, Buffalo; William C. Spring, Columbia University School of Public Health; and Roscoe P. Kandle, M.D., deputy commissioner of health, New York City.

tween State and local public health laboratories was limited to the situation in California.

## *Direct Services*

Tests performed by that State laboratory in one area of public health activity—direct services to physicians and health departments—vary with the size and facilities of local organizations. But in general, Bodily reported, they include virology, mycology, and parasitology examinations. The State also provides the tests most logically centralized in one laboratory, such as enteric phage and sero typing, food and drug examinations, and specific identification of problem cultures.

The local California laboratories, said Bodily, perform general serologic and bacteriological tests and give examinations the State cannot conveniently provide because of transportation and related problems.

## *Other Services*

Only a few State laboratories, according to Bodily, engage in biological production. Their standardization of biologicals is more important and often consists in evaluating various products and sending test results to local laboratories and manufacturers.

The extent of research programs varies widely among State laboratories, he continued, but most of them are in a position to search for new techniques and evaluate those which are proposed. He said research was well suited to the general consultative character of most State organizations and recommended the aid and encouragement of increased research activity at the local level.

Many States have an evaluation and approval program for their local organizations, Bodily reported. In some cases, it is only for 1 or 2 procedures. In others, it covers every phase of laboratory work and includes certification of personnel. These procedures benefit the State laboratories, he continued, by showing them how much confidence to place in work done at the local level, while public health personnel scat-

# Laboratory Grants and Research...

*The State and local laboratory areas of performance, their relationships, and their eligibility for PHS research grants are the subjects of three of the papers in this section. Research offerings include a test for identifying pathogenic fungi in sputum, a refined trichinosis test, improved microscopes, and the findings that streptococcal infection is spread mainly by direct contact, and that persons infected with Mycobacterium leprae react specifically to the standard tests for syphilis. Lowered skin resistance is suggested as an etiological factor in fungus infection of the feet.*

## Laboratory Can Do Much To Assist Others

Some public health services from State laboratories reach residents of all areas, and people in isolated localities depend on them almost completely, according to Howard L. Bodily, Ph.D., chief, division of laboratories, California State Depart-

ment of Health. This, he said, is a natural result of a division of activities by type of service and geographic boundary between State and local public health organizations.

Specific activities have been assigned to State and local organizations according to a variety of systems, he said, but the first part of his discussion on the relationships be-

Discussing isolation and identification of pathogenic fungi from sputum, Kuring outlined details for collection of the material.

### Preliminary Steps

Sputum should be obtained early in the morning and should come directly from the lungs. Saliva and nasopharyngeal secretions should be avoided.

The sputum should be carefully examined with a hand lens for the presence of the yellow or gray *Actinomyces* granules. Stained and unstained preparations of the tiny particles should then be examined microscopically.

The particles or other specimens of sputum for this examination should be placed on a glass slide and mixed thoroughly with one or two drops of 10 percent sodium hydroxide. A glass cover is then placed over the preparation and, after 3 to 5 minutes, it can be examined under subdued light for fungi.

### Sputum Cultures

The identification of fungi, except for *Actinomyces bovis*, *Blastomyces*, and *Coccidioides*, is difficult by direct examination of sputum, Kuring said. In all cases, diagnosis should be confirmed by cultural methods. Typical cultural and morphological fungus characteristics, he stated, are best demonstrated by the simultaneous use of brain-heart infusion blood agar and Sabouraud's glucose agar media.

The first culture medium is prepared by adding 10 ml. of blood, 2,000 units of penicillin, and 4,000 meg. of streptomycin to each 100 ml. of Racto brain-heart infusion containing 2 percent agar. Suspend a generous loopful of purulent sputum over the plates' surface, seal the plates with wide rubber bands to prevent drying of the medium. Two blood agar plates are incubated at 37° C., and two blood agar plates and the two Sabouraud's plates at room temperature. If actinomycosis is suspected, anaerobic cultures on

brain-heart blood agar without the addition of the antibiotics should also be made.

If periodic examination shows that the plates are negative, they can be discarded after 4 weeks of incubation.

### Identification

The pathogenic fungi, Kuring continued, are markedly different in appearance, both culturally and microscopically. Recovered colonies may be smooth or rough or cottony and filamentous with abundant aerial hyphae. Microscopic examination, he said, should be made of an unstained slide preparation from the colony.

Fungus identification, said Kuring, is based on the type of colony recovered, the appearance and location of spores, the presence, size, and shape of yeastlike budding cells, and the presence of arthrospores and chlamydospores.

### Hansen's Disease Patients React to STS Antigens

Serologic tests of persons infected with *Mycobacterium leprae* may provide a valuable indication of the specificity of the lipid antigens used in standard tests for syphilis, according to John F. Kent, Ph.D., chief, and Robert E. Hurligan, department of serology, Army Medical Service Graduate School, Washington, D. C., and A. Garcia Otero, M.D., Havana, Cuba.

Kent and his associates reported results of a study of 31 native Cubans infected with *M. leprae*. None of these patients showed either clinical or immunologic signs of treponematoses, and all of them were negative for treponemal immobilizing antibodies.

The eight serologic tests for syphilis used in the study included flocculation and complement fixation tests, and if a serum reacted to one or more of the tests, the degree of reaction was determined quantitatively, Kent and his co-workers said. They stated

that ordinary extracts of beef heart used as antigen produced the greatest number and the strongest reactions, whereas cardiolipin antigens produced a relatively low but variable frequency of "false" reactions. Fifty percent of the persons examined reacted to the Kahn standard test; only 12 percent reacted to the Army Medical Department's cardiolipin complement fixation test.

### Report the Refinement Of Trichinosis Test

Refinements of a complement fixation test for trichinosis, reported by Victor N. Tompkins, M.D., and Thelma Murschel, B.S., of the division of laboratories and research, New York State Department of Health, produce highly specific reactions and permit early detection of infection. Reaction persists only 6 to 18 months following infection.

Three types of tests for trichinosis depend upon reactions with humoral antibodies which develop during the course of *Trichinella spiralis* infection in man. Known as skin, precipitin, and complement fixation tests, their relative merit has been moot. With all of these tests, laboratory workers have encountered nonspecific results from cases known to be infected.

Using an antigen improved by Whitebky, Wels, and Hehle, several investigators had found that the complement fixation test of human serums had excellent specificity and greater sensitivity than skin or precipitin tests. Nevertheless, the test continued to fail to induce a reaction from serums of certain patients known to be infected. Tompkins and Murschel sought to reduce such failures by improvements in the technique of testing.

Three technical factors were found to influence the sensitivity of the test after many failures resulted from the use of an antigen level which had produced a maximum reaction from a single patient. One factor was that

undiluted serum often inhibits a reaction. It was recommended that serum should be tested not only undiluted but also in saline dilution 1:5 for this test.

The amount of antigen was the second factor. It was recommended that a wide range of antigen dosage be applied not only to establish maximum reaction but to detect reaction at all. Examinations of serums from more than 30 patients indicated that no single amount of antigen will detect reaction, whatever the concentration of the complement, but that three amounts can be expected to detect all reactions. The experience indicated the use of dilutions of 1:8, 1:64, and 1:128 in the presence of three units of complement.

The third factor was the amount of complement. Three instead of six units of complement increased sensitivity and in some instances allowed earlier diagnosis.

Reactions have been observed as soon as the first week of symptoms. In most instances, specimens collected between the 16th and 21st days of illness are the first to react. Reaction from one asymptomatic patient, however, was not obtained until 8 weeks had passed. Titer rises rapidly at first, reaches its maximum in the second or third month, then slowly declines.

## Discusses Improvements In Microscope Design

Although microscope design has been considered comparatively stable, significant improvements in mechanical and optical design have been made in recent years, according to James R. Benford, head, visual instruments department, Bausch and Lomb Optical Company. More improvements are indicated in the near future, he added.

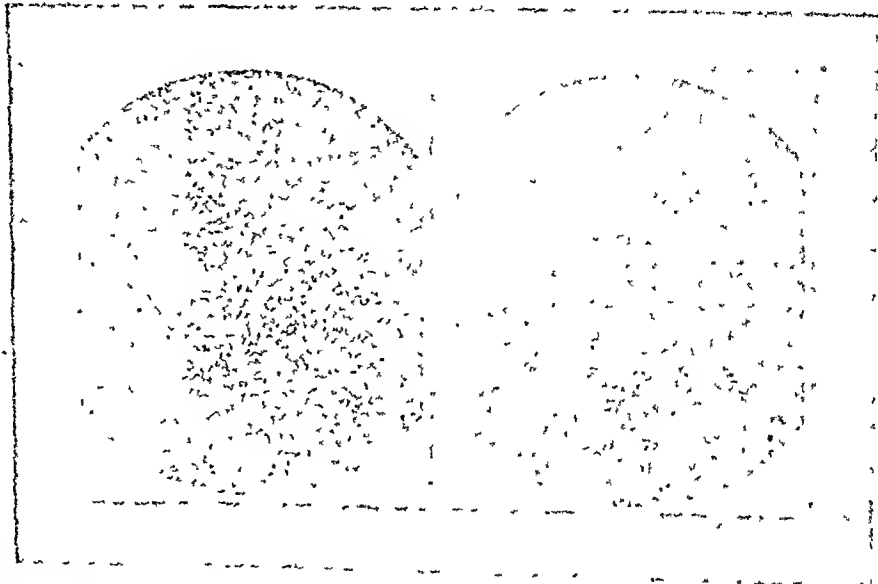
The mechanical design is often the deciding factor in the performance of a microscope in doing a given job, he said. Within the last few years

the standard microscope has been improved in stability, in durability, in manufacturability, and in convenience of operation, he reported.

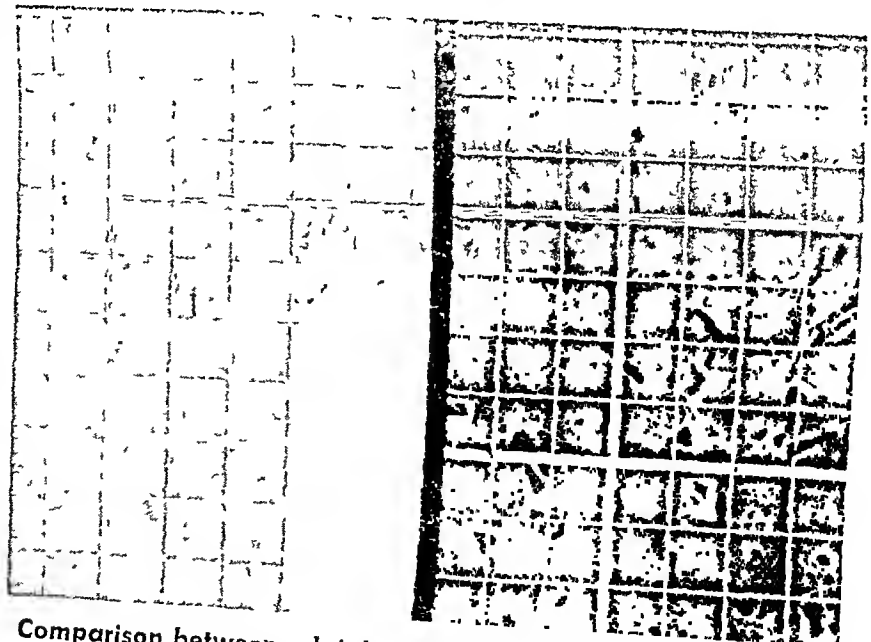
The use of ball bearings in the adjustment mechanism of microscopes provides frictionless fine adjustment accurate to within a small fraction of a thousandth of an inch,

he claimed, and greatly prolongs trouble-free durability of the mechanisms.

The introduction of phase microscopy, improved design of microscope eyepieces, and new instrumentation for ultraviolet microscopy are examples of improvement in optical design, Benford said.



Improvement in field coverage made possible by newly designed eyepiece using high index glass.



Comparison between a bright field image (left) and a phase contrast image of mineral dust particles.



## "Mr. Who" Comes to Thailand

"I cannot resist telling an amusing but pertinent story about the World Health Organization, which is known in many parts of the world as WHO. An Indian doctor working on malaria control in a remote village in northern Thailand asked the local headman a few questions: Had he heard of Mr. Nehru? 'No' was the answer. Had he heard of President Eisenhower? 'No.' Had he heard of the UN? Again, 'no.' Had he heard of WHO? 'Oh, yes,' the man replied, 'Mr. Who is the man who sprayed my house, and we have had no more sick babies—a very good man.'"

—DAVID MCKENNA: KEY

selves with the needs of these people, he added.

As for the people receiving WHO assistance, they are discovering that cooperative international action can achieve tangible benefits for them in their own lives, Key explained. They are discovering also, sometimes for the first time, that they themselves can actively participate in measures to improve their conditions. Apparently insignificant events, such as a mother taking her child to a rural health center or a village population working together to construct a sanitary well, often represent a new awakening of individual and community initiative, he said.

### Democratic Principles

Not only in its activities is the WHO helping to promote democratic ways of life but also in its organizational structure, the Assistant Secretary noted. In this respect, he stressed WHO's use of regional offices and regional committees, which, he said, enable it to be particularly responsive to the wishes and needs of member states.

Key outlined the procedure as follows: First, nations discuss with the regional office staffs their needs for various types of WHO assistance. Then, regional committees meet to discuss health needs and to review a health program for their areas. Only after this regional review are the programs submitted

to WHO headquarters for integration into an overall annual program and for final approval or modification by the annual world health assembly.

## WHO Consultant Recounts Experience Overseas

"The most impressive person I met in Yugoslavia was . . . a health officer whose area was in a difficult terrain and whose people suffered because their diet was deficient in protein. With a reformer's zeal and a diplomat's finesse, he had persuaded his people to dam up a stream to build a small lake, not for hydroelectric power, but to grow fish."

This was one of the incidents related by Paul V. Lemkau, M.D., associate professor of public health administration, Johns Hopkins University School of Hygiene and Public Health, in an informal report on his 6-week tour of Yugoslavia in 1951 as consultant for the World Health Organization.

The prevailing topic of discussion as the consultants and their Yugoslavian hosts traveled over the rough and winding roads of the country, particularly in Serbia, Bosnia, and Macedonia, Lemkau recalled, was the condition of the toilets. They usually wouldn't work at all and were far more unsanitary than pit

privies, he said. One of the Yugoslavians advocated an educational program to get the situation improved, while another contended that a law should be passed, thus provoking the basic philosophic argument of force versus education, the WHO consultant noted.

At the end of World War II, Yugoslavia directed its attention to social reform, particularly toward improving the care of children, Lemkau said, noting the prevalence of institutions for children, from nursery schools for children of working mothers to institutions for adolescents. The specialized but briefly trained teachers called defectologists seemed, for the most part, to be doing good work, he said. Foster care was just beginning to be tried out, and the workers using it were enthusiastic about the early results.

### Observations in Japan

From a similar tour in Japan in 1953, Lemkau reported that in general the Japanese had much knowledge but that they tended not to use it because of lack of funds or, sometimes, because the knowledge was not associated with a real drive to change things. For example, he said, everyone seemed to know that fever was no longer really needed for the treatment of paresis; yet it was almost universally used. Perhaps the fever boxes were so hard to get, Lemkau suggested, and so costly that the Japanese did not want to give them up.

## Disease Control Efforts Prove Effective

The work the World Health Organization has done in bringing order out of the chaos of international quarantine was cited as one of its noteworthy achievements by Arthur S. Osborne, M.D., international health representative of the Public Health Service.

Together with its system for disseminating epidemiological information, the International Sanitary

Regulations of the WIIO have set up an almost impervious barrier against the importation into this country of the so-called convention diseases, Osborne specified.

As an example of the value to the United States of WIIO's reporting system, he mentioned its effectiveness in connection with the recent occurrence in Trinidad of the first cases of urban yellow fever in 20 years. Pointing out that one-third of the United States is a yellow fever receptive area, he said that the reporting system has given us time to set in motion the machinery necessary to exclude the disease.

### *Rabies Control Efforts*

Osborne cited rabies as one of the diseases which shows the effect of action among the community of nations making up WIIO. More dramatic even than the mass vaccination campaigns, he said, is the announcement of the result of the study sponsored by the WHO on the use of hyperimmune serum. There is now evidence that this material, which is used in conjunction with vaccine, will confer immediate passive immunity that will protect a person exposed to rabies until an active immunity is built up by the vaccine.

Rabies, endemic throughout the world except in certain limited areas, has been no small problem to the United States, particularly in the southwestern States since the disease is hyperendemic in Mexico, Osborne noted.

Concerning mass vaccination campaigns, he mentioned the field tests of avianized rabies vaccine in Israel and Malaya, where the disease in its enzootic form has been a serious problem. In Israel, after 3 years of mass vaccination of dogs, only five cases of rabies in animals were reported in 1953. In Malaya in August 1952, just before the start of the mass immunization program, there were 41 cases of laboratory confirmed rabies; by June 1953, the disease had disappeared from the country.

In Mexico, an intensive antirabies program has resulted in a drop from 37 human cases in 1952 to 4 in the first 7 months of 1954, he said. A similar reduction is apparent in the United States, the number of cases dropping from 21 in 1952 to 5 in the first 9 months of this year.

Osborne also mentioned the WIIO work on controlling traffic of addiction-producing drugs, the standardization of biologicals, and the International Pharmacopoeia as part of the measurable benefits the United States has received from its participation in WHO.

### **Indonesians Receptive To Health Program**

Widespread information about health problems and a universal desire for better health services were found by John C. Hume, M.D., Dr.P.H., in Indonesia when he visited the country early in 1954. He believes it inevitable that the country will attain a high level of health services, given only time, moderate assistance, and freedom from war.

Dr. Hume, associate professor of public health administration and assistant director, Johns Hopkins University School of Hygiene and Public Health, was in Indonesia as a World Health Organization consultant. His major assignment was to review the yaws eradication project. This project, he said, is only one of many health programs in the country and one of several joint ventures of the national government and the World Health Organization.

A tour of the island of Madura in the company of its regent and vice regent enabled Hume to observe how deeply interested Indonesia's civil leaders are in health problems and programs. Not only did they have a detailed knowledge of the yaws eradication program—of how much work had been done and of how much remained to be done in their regency—but they had good general

information about the disease itself. Moreover, they had an intelligent grasp of the health problems facing Madura, in terms of both specific diseases and the difficulties posed by shortages of trained personnel. The leaders expressed to Hume their interest in broadening the health programs and in raising the level of general medical and public health practice.

A major problem in Indonesia, with its 80 million people scattered over some 2,000 islands, is that of transporting men, equipment, and supplies from one island to another, Hume pointed out. That the task of providing health services in this country is an enormous one is demonstrated, he said, by the fact that in 4 years, the yaws eradication program has been able to reach only about 15 percent of the people.

### *Combating Yaws in Haiti*

Although Haiti has social, economic, and health problems comparable to those of Indonesia, it has made considerably greater progress in combating the problem of yaws, according to Hume's report. Since the yaws eradication project began in February 1951, almost all the country's 3½ million people have received treatment, and, according to the latest estimates, the percentage of the population demonstrating lesions of yaws has dropped from about 15 to less than 0.03, he announced. He served as a WHO consultant in Haiti for 2- to 6-week periods during each of the past four summers.

The dramatic results of the program are apparent to all the population. "The news travels far and wide by word of mouth and probably by drums as well. In the early days of the campaign, it was not unusual to see persons crippled with crab yaws who had hobbled 30 to 40 miles to receive a penicillin injection. More difficulty was encountered in preventing persons from moving along with the treatment teams and receiving therapy in successive villages than in persuading reluctant

individuals to receive treatment," Hume said.

Commenting on the future of public health work in Haiti, Hume reported that the health authorities are planning a broadened program and that the citizens are eagerly awaiting the new services. New programs must, of course, come gradually, as financial limitations and shortages of public health personnel permit, he noted.

## Overseas Health Programs Sow Seeds of Democracy

In helping to raise social and economic standards in the underdeveloped areas of the world, public health can be used to prevent communism from taking root and can strike at its most vulnerable point, according to John A. Logan, Sc.D., chairman, department of civil engineering, Northwestern University Technological Institute.

Logan warned that the United States could lose leadership in the practical application of technology in the undeveloped areas, unless planning is unified and the need for cooperation with local communities is more appreciated.

Public health workers have served for more than a century as a "social conscience" with regard to the improvement of health and sanitation in the United States. They must now apply the same approach to the world, he said.

Logan suggested that a key to the future success of our overseas development program lies in the willingness of health officials to work with nonprofessional groups and to accept leadership in the broad field of development. He pointed out that this is of particular importance to the health engineer because of the contribution that the engineer can make overseas to environmental sanitation. Likewise, engineering training gives the engineer special competence in the collection and im-

partial evaluation of data and opens opportunities for leadership.

### Community Development

Logan pointed out that this country has developed technical competence in the field of regional planning. He cited the Tennessee Valley Authority as an example. He urged greater knowledge of multipurpose community improvement, which he termed "the keystone to successful large-scale foreign operations."

As known today, the community development concept evolved in China from the mass education movement of the 1930's from which came sufficient experience to establish the following basic needs, which Logan expressed as the principles of self-help:

The need for regionalization—the incorporation of groups of communities within a rational administrative unit.

The necessity for community or village committees and voluntary workers as the basis of the self-help movement.

The need for a multipurpose approach—although an important objective of development is self-sufficiency in food production, it is now recognized that increased agricultural production cannot be brought about on any important scale unless the twin obstacles of disease and ignorance are simultaneously attacked.

The necessity of providing priorities with regard to the objectives of development, usually beginning with the satisfaction of "felt" needs.

The necessity for the removal of the economic and social obstacles to the dignity and development of the individual, including such factors as cultural prejudice and the feudal barriers to the ownership of land.

"Community development should not be looked upon as a specialized branch of any particular government department," Logan added, emphasizing that regardless of how this

fundamental technique of development is administered it should provide an integration of all departmental interests at the village level.

"The active participation of local people in their own betterment not only alters the attitude toward development from that of an imported foreign procedure to something understood and appreciated, but it directly utilizes one of the most important capital resources of the underdeveloped areas, the productive capacity of the population," he noted.

## WHO and United States Cooperate in Iran

The bilateral programs of the United States can create a greater impact with their greater financial resources and through their more direct relationship with host governments, but the multilateral approach of the World Health Organization is really the long-range approach to technical assistance, declared Emil E. Palmquist, M.D., M.P.H., who served as chief of the public health division of the United States Operations Mission to Iran from 1951 to 1953. He is now assistant chief, Division of International Health, Public Health Service.

Palmquist gave several examples of the close working relationship established in Iran between the United States mission and WHO personnel. One was the malaria control program, which was guided by a malaria control commission made up of representatives from the Iranian Ministry of Health, the School of Medical Sciences of the University of Teheran, a WHO advisory unit, and the United States mission. Another was a tuberculosis control demonstration center, for which WHO provided seven technicians and the United States mission supplied administrative services and some of the equipment.

Describing briefly some of the public health activities under way in this

country, Palmquist emphasized the malaria control program, which he said has produced spectacular results. In the Caspian Sea area, for example, the incidence of malaria dropped from 90 percent in 1949 to 9 percent by the end of 1953, he reported.

Other programs mentioned included an extensive environmental sanitation program; demonstration health centers, which emphasize the training of sanitarians and women health visitor-midwives; programs involving acute communicable disease, trachoma, tuberculosis, and venereal disease; and an extensive health education program.

## Technical Aid to Vietnam Stimulated Local Action

Speaking from his 2 years' experience with the United States technical assistance program in North Vietnam, Warren Winkelstein, Jr., M.D., M.P.H., declared that the program has led to improved public health operations in that country not so much through the provision of any specific technique as through the stimulation of action and the exchange of ideas. He considered particularly important the help given local personnel in developing confidence in their own capacities.

Dr. Winkelstein, now director of the division of communicable disease control, Erie County (N. Y.) Health Department, was regional representative for North Vietnam of the public health division, United States Special Technical and Economic Mission to Indochina, from 1951 to 1953.

The relationship of the foreign technician to the local health worker was early recognized as one of the problems to be met in this country, Winkelstein reported. It was necessary to establish confidence on the part of the local officials in the fact that there were no strings attached to the technical aid, he said. It was necessary further, he specified, to

help the health department leaders develop enough confidence so that they could undertake activities of a scope not previously envisioned and so that they could sustain ordinary failures without losing perspective.

Winkelstein attributed the local health personnel's reluctance to proceed with programs and their emphasis on the need for material aid to the fact that responsibility for activities was comparatively new to them. They therefore clung tenaciously to tangible objects and were afraid to venture into actions results of which were not entirely predictable, he contended.

### Health Problems and Programs

Discussing the conditions in North Vietnam at the beginning of the technical assistance program, Winkelstein noted that outside the cities of Hanoi and Haiphong there were

only 3 or 4 physicians and that there was an almost complete lack of medical facilities in the rural areas where most of the people lived. He listed as the major health problems trachoma, smallpox, infant mortality, gastrointestinal diseases, malaria, and tuberculosis.

A field program for the treatment of trachoma and a village dispensary program were two of the United States assisted projects that Winkelstein described. The latter program, which he thought was perhaps unique, involved the provision of a kit of drugs and medical supplies to any village that would send a local person to a training institute for 2 weeks, would furnish a suitable location for the dispensary, and would make the treatment available to the people without charge. More than 1,000 villages established these dispensaries, he reported.

## Programs in Dental Health . . .

*Emphasis on dental care for children; the use of educational techniques; and clinical research in such fields as oral pathology, periodontal disease, and the growth and development of dental structure in children are features of five programs designed to promote dental health.*

### Michigan Gathers Data On Child Dental Care

The most effective approach in a dental corrective program is to begin with the younger children, correct all existing dental defects, and then recall the patient periodically for maintenance work. With this working hypothesis and with a statewide program as an objective, the Michigan State Health Department established a dental clinic in Sturgis in 1945. Data on the time required to care for dental needs of Michigan children as well as infor-

mation on the annual increment of caries were collected by the clinic.

Charles J. Donnelly, D.D.S., M.P.H., dental officer in the public dentistry section of the Michigan State Health Department, presented the findings of the pilot study. The data, he said, substantiate the conviction that the benefits are not limited to the group under treatment but extend to other children and even to adults in the community.

### The Plan

With the cooperation of local dentists and school authorities and

with the approval of the Michigan State Dental Association's Board of Trustees, the plan was carried out in Sturgis (7,000 population) because it had never had any kind of dental health program.

Donnelly reported that the initial care program was limited to pre-school, kindergarten, and first and second grade children; that once the child's accumulated dental needs were cared for, complete maintenance care was given periodically; that the plan provided for the addition of a new group of children every year; and that maintenance care for a 12-month period required between one-third and one-half the time needed for the initial correction of accumulated defects.

To determine how many parents would accept dental care for their children, no concentrated educational program was undertaken at first to enlist them, Donnelly said. In the beginning, 73 percent of those eligible took advantage of the clinic facilities. Acceptance, he said, varied from year to year with the effort expended to explain the objectives and value of the program, and—as the reputation of the clinic gained—finally approached 100 percent.

High standards were set and a high quality of service was maintained, Donnelly said. For instance, bitewing radiographs were taken annually and other radiographs when necessary, in addition to treating carious teeth, removing infected teeth, pulp-capping, pulpotomy, castings, and analysis of saliva samples. Lactobacillus counts and caries history determined the number of recalls, which averaged two per year.

The individual services given by the dentist were timed by the assistant. It was found that a full year of maintenance care requires only about 1 hour of dentist chair time (up to the age of 12 years), he said.

Donnelly cited statistical results which, among others, showed: that the time required for initial care of accumulated defects ascended from 83 minutes for the average 5-year-old to 173 minutes for the average 9-

year-old; that maintenance care varied from 56 minutes for the 7-year-old to 128 minutes for the 14-year-old.

A 5-year evaluation of the plan was made in 1951. Much of the data is yet to be analyzed, Donnelly reported. The Sturgis program employed one dentist and at the close had nearly 800 active cases under treatment.

## Clinical Dental Research Probes Into Many Areas

Patients are being studied at the National Institute of Dental Research to obtain more information on problems in such fields as oral pathology, periodontal disease, and the growth and development of dental structure in children, said Ralph S. Lloyd, D.D.S., chief of the Dental Department at the National Institutes of Health Clinical Center, and acting chief of the NIDR Clinical Investigations Branch.

In the first year of the Clinical Center's operation, Lloyd said, National Institute of Dental Research investigators began several laboratory, field, and clinical research studies of dental problems. Among the particular interests of NIDR research workers are those problems—such as chronic stomatitis, gingivitis, and leukoplakia—demanding combined medical and dental attention. The complete and detailed series of diagnostic and other tests carried out for each patient at the Clinical Center offer valuable material for such investigations, he continued.

For instance, a study of the systemic condition of persons with periodontal disease was recently undertaken. A method of gauging the severity of this disease, which involves tissues surrounding the tooth, proved valuable in field studies and was given a successful clinical trial. It was found, according to Lloyd, "that an accurate periodontal score could be assigned by a cursory glance." The patient's clinical rec-

ord is then examined for conditions which may be correlated with the periodontal finding.

## Fluoride Studies

Three of the research studies which Lloyd reported deal with fluorides. An epidemiological survey of the physiological effects of fluorides in the drinking water of two population groups is being conducted. A related investigation is concerned with the possible histological or chemical changes in individuals who live in high-fluoride areas. Lloyd described the third investigation as a "carefully conducted balance study" in the measurement of fluoride turnover for patients with cardiovascular or renal diseases as compared to the turnover for normal persons in control units.

## Other Fields

In the field of growth and development, more simplified ways of treating specific types of malocclusion are being sought. Lloyd said that other projects in this field include continuation of research begun elsewhere, such as the study of the growth and development of the heads of young children who have cleft lips and cleft palates, and of children with other congenital and acquired anomalies.

Data are to be accumulated on general anesthesia used in oral surgery to aid in the evaluation of the new, intravenously administered drugs. Also, investigators plan to begin a study of cysts of the mandible and maxilla.

A comparison of conservative and radical surgical techniques in the treatment of periodontal disease has been started, so that, with other clinical investigations, NIDR research workers may develop diagnostic criteria which will help to forecast the result of treatment.

## Future Plans

Other studies suggested include studies of the effects of radiation on oral health and oral infection, of the effects of steroids, hormones and re-

lated substances on oral lesions, and of dental prosthetics. An investigation in the last named group would deal with tissue tolerance to the prosthetic appliances. A study intended to discover ways of determining a definite working and rest bite in prosthetics has also been suggested, according to Lloyd.

## Assign Learning Programs To Education Specialists

In conducting educational programs in dental health, the health department should seek assistance from specialists in educational methodology, suggested H. Shirley Dwyer, D.D.S., director, division of dental hygiene, Arkansas State Board of Health.

He described an experimental dental health teaching project which demonstrated that by stimulating the school teacher's interest and by providing the facts the teacher was able to transmit the health lessons to the school children in an understandable form and integrated with the regular school subjects.

The use of a health coordinator in each of Arkansas' schools resulted subsequently in the appointment by the State Dental Society of Arkansas of a dental coordinator for each school, he said. The coordinator supplies the teachers with dental information, checks expenditures for educational materials, and helps stimulate greater efforts in promoting dental health. He is the dental society's representative to the conferences called by the State departments of health and education. His position offers a practical means of promoting dental health education at the local level.

### *The Dental Columnist*

Dwyer said the press could be invaluable in promoting a dental health program. He pointed out that in preparing a daily column a person with newspaper training could translate the technical terminology of a

profession into the "earthy" language of the people, and also could take a local slant on items. A chatty style, colorful use of familiar words, and short sentences are necessary, he said, in warning that much material intended to be educational results in being only promotional.

In discussing use of radio and television for dramatizing public health programs, Dwyer cautioned that care be taken to make one point of emphasis only per broadcast. "Do not throw the entire dental textbook at them in 15 minutes," he said.

"Get the community interested in doing," Dwyer advised. Organize a community health council and point the way so that it can discover its own community needs, and, he added, the desire to meet these needs is almost sure to follow.

## Maryland Dental Service Stresses Child Care

An evaluation of the Maryland dental service program after several years of operation showed that a too high proportion of expenditures was going for prosthesis and too little for children's dentistry, according to Richard C. Leonard, D.D.S., M.S. P.H., chief of the division of dental health, Maryland State Department of Health.

To reverse these proportions, he said, children's services were expanded to include school dental clinics for all children.

The revised prosthesis service policy authorizes dentures for eligible persons 45 years of age and younger. Persons over 45 years of age must obtain approval of need for the denture from the County Advisory Committee on Medical Care. A decision based upon the financial status of the program in relation to the patient's financial and medical status is made.

Leonard reviewed the State's medical care program beginning with its reactivation period in 1939. Legislation, effective June 1, 1945, placed

the program under the guidance of the new State Council of Medical Care. All services at that time were limited to the indigent, said Leonard. The dental service program was an integral part of the medical care plan.

Control and administration, so far as possible, were initially handled by county authorities and county professional groups. This made the extent of services vary from county to county, Leonard pointed out. Uniformity of program has now been achieved, he explained, and both the amount of service and the character of service have changed during the years. For example, fluoride therapy and prosthetic service are now offered, more emphasis is now placed on preventive dentistry, and the school dental clinic work has greatly expanded and now requires no economic limitation for children.

### *Dentists Cooperate*

In 1952, approximately 50 percent of the Maryland dentists practicing in county areas participated in the dental care program, Leonard said. On each county advisory committee a practicing dentist represents the profession, another of many evidences of the cooperation of the dental profession in helping to develop the program, he noted.

Leonard recognized as justifiable the criticism of the low fees paid to participating dentists. This shortcoming, however, is governed by a legislatively determined budget which limits ability to raise fees.

In behalf of the dental fee schedule, Leonard said the fees are the high average of those suggested by county dentists and that too high fees would have threatened to defeat the entire program. Prior to the inauguration of the program, he pointed out, dentists gave a great deal of free service to the indigent and the medically indigent. The present fee schedule is at least some reward, he felt.

The indigent population of Maryland has varied between 13,000 and

17,500 persons, better than 50 percent of whom may be classified as aged persons (over 6,000 are over 65 years of age). About 31 percent of Mary-

land's indigents are under 20 years old and only approximately 12 percent are between 20 and 46 years old, said Leonard.

cumulative effects of exposure to small quantities of chemical and physical contaminants of air and water, Andrews concluded.

To obtain etiological and epidemiological information about the consequences to human health and effectiveness of exposure to these substances, the sanitary engineer, he believes, will need to work closely with the toxicologist, the pulmonary physiologist, the pathologist, the roentgenologist, the radiologists, occupational health specialists, and with other sanitary engineers.

## The Sanitary Engineer . . .

*The many and complex problems of environmental sanitation and the challenges they present to engineering research are discussed. The new research program being developed by the Lawrence Experiment Station of the Massachusetts State Department of Public Health is described.*

### Epidemiologist-Sanitarian Collaboration Urged

New environmental controls to protect health will be needed as industry develops new techniques, stated Justin M. Andrews, Sc.D., Assistant Surgeon General and associate chief for program, Bureau of State Services of the Public Health Service.

The health implications and dimensions of these techniques must be determined, however, before controls can be instituted, and current practice in the control of communicable diseases, as well as new procedures and indexes, must be carefully examined, Andrews said.

In this connection, Andrews stated that epidemiological evaluation of isolation and quarantine has led to discontinuance of these measures in the control of some diseases and confirmed their usefulness in others.

Epidemiological review of fly control in the prevention of pottingettis demonstrated that this disease was apparently spread by contact with infected individuals or with carriers rather than by flies, he said. Epidemiological investigation revealed that malaria was spread by only a few species of mosquito and that control of those species was more

economical than control of all mosquitoes.

Andrews suggested that, in view of the disappearance of cholera and the decline in numbers of typhoid carriers, the coliform index might also be reevaluated epidemiologically.

Bacteriological cultures of rectal swabs from children aged 10 years or less have given immediate and objective results, which are not obtainable from mortality and morbidity data, Andrews stated.

He suggested that this procedure, together with comparisons of the prevalence of carriers in homogeneous populations, might be used by teams of epidemiologists and sanitary engineers in studying the epidemiology and evaluating the control of enteric diseases.

### Water and Air Pollution

Other areas in which sanitary engineers and epidemiologists can work together are water and air pollution control, Andrews stated. He stressed chemical and radioactive air pollutants and said that health, physical effectiveness, safety, and comfort will all be affected with increases in population, urbanization, industrialization, and the use of atomic energy.

Little is known about the chronic,

### Relocated Lawrence Station Develops New Research

The Lawrence Experiment Station, established in 1886 as part of the Massachusetts State Department of Public Health, has produced a roster of distinguished scientists, teachers, and natural philosophers who have united engineering and biology in the new world of sanitary science.

The station has been a proving ground for students and teachers from New England university engineering departments, including the Massachusetts Institute of Technology, as well as others seeking practical solutions to sewage and industrial waste disposal.

Thus, Clarence I. Sterling, deputy health commissioner of Massachusetts and chief sanitary engineer of the State health department, reviewed the station's contributions to research in public health. Thousands of problems have been tackled by its staff over the years, he said.

The station today is developing a new research program in keeping with its move to a modern building and new site, also, like the old site, along the Merrimack River at Lawrence, Mass., Sterling said. The new site was carefully selected in order that sufficient domestic sewage could be obtained to carry on the research work.



The new buildings house the formerly scattered bacteriological, radiological, biological, water and sewage, and air pollution laboratories. A special research laboratory has been set up to familiarize laboratory personnel with new techniques. A new plumbing research laboratory will train apprentice plumbers and others in the relationship between good plumbing and public health. One branch laboratory is still located at the University of Massachusetts at Amherst in the western part of the State.

Sterling said that the station has appointed a board of research consultants to help solve many of the new problems in sanitary engineering. Board members include the following representatives of the profession:

Harry P. Burden, Tufts College; Rolf Eliassen and Clair N. Sawyer, Massachusetts Institute of Technology; Ralph L. France, University of Massachusetts; Harry G. Hanson, Public Health Service; Charles E. Renn, Johns Hopkins University; Gordon M. Fair, J. Carrell Morris, and Leslie Silverman, Harvard University.

## Many New Complexities Challenge Researchers

Pressures of population and technology are rapidly unfolding new challenges to the sanitary engineering profession, according to Assistant Surgeon General Mark D. Hollis, chief engineer of the Public Health Service.

Among environmental forces injecting complications in public health work are the increasing variety and potency of polluting wastes, including those that are radioactive, in all phases of man's environment—air, water, food, shelter, and even space, Hollis pointed out. Methods of detecting, identifying, measuring, and appraising the quality of pollutants, especially in the atmosphere and in water are as yet insufficient to satisfy

needs, he maintained, if controls are to be applied effectively and economically.

Although indicators and classical yardsticks now in use suited the needs of other times, Hollis said, "over-extension in their use by default is no solution to the newer problems. There is increasing evidence, for example, of waterborne virus diseases, yet we have no practicable methods for detecting their presence in water, nor any firm knowledge of the capacity of ordinary treatment facilities to remove them."

From still another angle, Hollis pointed to the failure to capture, reclaim, and put to productive use many wastes that are now being dissipated.

"Even in our own land," he said, "the relative decrease in availability of agricultural resources, such as fixed nitrogen, phosphates, and soil conditioners, has been reflected in notable increases of dollar value placed on fertilizers. It is anticipated that this trend will continue. As the relative abundance of basic resources decreases, the energy and dollar costs of conservation are more readily borne by the community."

Hollis called attention to current processes which recover many valuable materials heretofore regarded as wastes. Drying of sludge, recovering vitamin B<sub>12</sub> from sewage, and composts from solid wastes, and conversion of sewage into algal food, he regarded as symptoms of a trend which may be accelerated as population pressures increase.

"The sanitary engineering objective of waste disposal may profitably be shifted to include waste conversion and re-use," Hollis stated. "In a very substantial way sanitation will be facilitated by showing man how he can supply some of his basic demands by re-using what he already has."

He expressed hope that sanitary engineering research may be stimulated by close collaboration of the Robert A. Taft Sanitary Engineering Center with universities and other research resources. In addition to

offering its services to these institutions, the center will focus its attention on development of methods for applying basic knowledge to national and regional problems which individual State institutions and industries find are beyond their jurisdiction or resources.

The center is now exploring methods of bringing its application work into phase with basic research of other institutions.

## Lists Planning Objectives For Sanitary Engineers

The World Health Organization estimates that 20 percent of the deaths in the world today are due to faulty environment, stated George O. Pierce, M.S., chief, environmental sanitation branch, Pan American Sanitary Bureau, Washington, D. C.

In many Latin-American countries, enteric diseases are still a leading cause of death, Pierce said, and effective methods of control of some other diseases related to the environment are not yet developed, as in the case of bilharziasis.

A variety of disciplines are needed to solve the many and complex problems of environmental sanitation, Pierce stated. Teamwork will be necessary between sanitary engineers and specialists in the physical, chemical, biological, and social sciences if solutions are to be found now and for problems that will result in the future from advances in technology, he said.

Sanitary engineers must be public health statesmen, Pierce said. They must be able to work with representatives of other governments and with specialists in agriculture, education, industrial production, and communications, and they must endeavor to understand what other people do, how they work, and the legal and other restrictions which apply to their work. In many countries, water supply and waste disposal problems will not be solved until economical, technically sound,



and socially acceptable methods are found, he said.

### Planning and Administration

Pierce stated that the most important basic problem in public health is leadership in program planning and administration. He said that the community must be educated to do its part in the planning, and that the support of the medical, nursing, and organized engineering professions must be enlisted.

Plans for community health programs should include the collection of information on population characteristics, vital statistics, health institutions and personnel, governmental structure, voluntary health agencies, social institutions and

customs, economic status of the population, geography, and climate, Pierce said.

In conclusion, Pierce stated that sanitary programs produce economic gain and help to control or to eradicate disease; as a result of improvements in health, a larger number of persons are gainfully employed; the economy expands because of new markets and new sources of labor and materials; and crop yields increase.

Results of changes in environment, he said, can be measured by reduced stream pollution, increase in number of families with safe water supplies, the quantity of available water per person, and other environmental factors.

the test of a readability formula. But in terms of the ultimate objectives, such evaluation assumes that the literature will reach a large proportion of the population for whom it was intended, that it will have some effect in motivating the reader, and that eventually a reduction in mortality will ensue.

According to the authors, what is loosely termed "evaluation" in public health is similar to diagnostic research in clinical medicine. "Evaluation" they restricted to "followup of effect of treatment." In the public health sense, treatment of the community is the institution of certain social actions for specific purposes, such as more clinics.

### A Design for Evaluation

In designing evaluation studies, certain fundamentals merit consideration, Greenberg and Mattison said. These they listed as:

1. The need for a clear definition of the target population to be exposed to the program under evaluation.
2. The selection from the target population of a smaller group labeled the "sampled population" for intensive followup of the therapy.
3. The identification of particular subgroups within the sampled population so that individual variations of the program's effectiveness may be pointed out.
4. The division of the sampled population according to some experimental design into two homogeneous groups, experimental and control, and their allocation according to some scheme of randomization.
5. The application of a placebo to the control or comparison group to establish the validity of the evaluation.

Measurements for the two groups are made in accordance with the criteria and at the time agreed on, the authors continued. Comparisons are drawn, and if differences are observed, they are ascribed to the differences in treatment. If the sampled population represents a group of persons smaller in num-

## Health Program Evaluation . . .

*Not all measures of the effectiveness of a health program require the assistance of experts in statistics and the social sciences, but whatever the yardstick used, it must be handled with precision, in terms of well-defined objectives—according to the papers presented.*

### List Steps for Designing Evaluation Programs

Evaluation of a public health program should denote a measurement of its effectiveness, stated B. G. Greenberg, Ph.D., professor of biostatistics, University of North Carolina School of Public Health, and Berwyn F. Mattison, M.D., M.P.H., commissioner of health, Erie County Health Department, Buffalo, N. Y. "This effectiveness," they said, "should be measured in terms of the fulfillment of the program's objective."

Preparation of a clear-cut statement of the objectives is the first step in evaluating a program, they said. The person best qualified to state these objectives is the one re-

sponsible for instituting the program.

They said that formulation of the criteria for measuring the successful achievement of the intermediate goal and the design of an experiment or research study to measure precisely the criteria of success previously developed are the ensuing steps.

The ultimate objectives of most health programs, namely, reduction of mortality and morbidity, are too remote to be worthwhile indexes for evaluating a program, the authors continued. Consequently, a multitude of intermediate goals are substituted.

For example, in the preparation of health literature, the literature could be considered by some as having been "evaluated" if it passed

# PROGRAM EVALUATION

ber than the target population, then differences between the two study groups might have arisen because of sampling fluctuations.

Tests of statistical significance are usually available to rule out or measure this possibility, they said, but it is inappropriate to use these tests for errors of observation other than those caused by sampling variations since such errors are apt to be much greater in size than the sampling errors.

## Every Program Step Needs Evaluation

Even if the term "evaluation" is limited to an appraisal of final program results, the first step in the process must always be an appraisal of the yardsticks used, maintained George James, M.D., M.P.H., and Herman E. Hilleboe, M.D., M.P.H., of the New York State Department of Health.

Dr. James is assistant commissioner for program development and evaluation, and Dr. Hilleboe is commissioner of health.

Of what use, they asked, is a final evaluation if the standards employed are unreliable, invalid, or unnecessary? They consider evaluation more as a scientifically critical point of view which must be built within chronic disease programs during each phase of development than as a special procedure which should be performed periodically.

The validation of the yardsticks forms short-range objectives for the program of the Albany Cardiovascular Health Center. James and Hilleboe stated it is with these yardsticks that planners can build step by step toward the long-range goals. It is in terms of these yardsticks, and only in such terms, that a true evaluation of the long-range goals becomes possible, they declared.

In their opinion, it is unlikely that a scientifically precise evaluation of any existing program for the "control" of adult heart disease could be performed using the yardsticks and

disease classifications now available.

To indicate the types of evaluations which should be performed in the development of a new and complex program, James and Hilleboe presented selected data from the first 1,494 examinations performed at the Albany Cardiovascular Health Center. The center was established in 1953 to provide periodic examination of the cardiovascular status of 2,000 male State employees, aged 40-54 years, in the Albany area.

## Medical History

Noting that physicians frequently place great reliance on the medical history of their patients in making a diagnosis, they offered the following data:

"Pain, heaviness, or discomfort in the chest" was the symptom with the greatest relative frequency among patients with coronary heart disease, in comparison with patients with hypertensive heart disease, hypertension, or hemorrhoids. "Aching or tenderness around the heart," "unusually fatigued during day," "feel choked or smothered," and "short wind" were symptoms also associated significantly with coronary heart disease, but "feel heart beating," "heart races," and "ankles swell" occurred about equally in all the diagnostic groups.

Would each competent physician

elicit the same symptoms from the same patient? This is one of the questions, they stated, that must be answered before deciding to rely for screening purposes on the five symptoms which appeared most frequently among coronary heart disease patients.

They found that eight physicians seemed about equal in eliciting the third, fourth, and fifth symptoms given above, but not in eliciting the first and second.

They found, further, that two physicians were responsible for the bulk of the variance for the first symptom and one physician for the second symptom.

Also presented as illustrative of evaluation in terms of short-range objectives were data on the family history of the patients; on the electrocardiogram and the X-ray film as techniques for detecting cardiac enlargement; and on the association of age, obesity, and blood pressure.

## Long-Range Objectives

To develop and evaluate measures of the prevalence and incidence of various conditions among the study group, one of the long-range objectives of the program, requires a relatively low refusal rate among this group, James and Hilleboe pointed out. They reported an overall refusal rate among 1,677 State employees of 10.9 percent. The next

**Diagnoses made at the Albany Cardiovascular Health Center among 1,394 persons, aged 40-54 years**

Disease	Diagnosed at center		Previously known		Newly diagnosed	
	Number	Rate per 1,000	Number	Rate per 1,000	Number	Rate per 1,000
Tuberculosis.....	48	34	26	19	22	16
Bronchial asthma.....	11	8	5	4	6	4
Diabetes.....	15	11	12	9	3	2
Chronic arthritis.....	22	16	18	13	4	3
Coronary heart disease.....	42	30	30	21	12	9
Hypertensive heart disease.....	42	30	0	0	42	30
Hypertension.....	184	132	62	44	122	88

step, an attempt to assess the extent of heart disease among the refusals, is now being developed, they said.

Concerning prevalence of the various heart diseases in the group, they provided the data in the accompanying table. The diagnostic categories are based upon currently detectable signs and symptoms, they said. In their opinion, these are almost certainly not the best possible yardsticks for this purpose.

## Sampling in the Evaluation Of Education Materials

Small, carefully selected population samples can be adequate and can be used to advantage in evaluating health education materials in the process of development, stated Irwin M. Rosenstock, Ph.D., assistant chief, Behavioral Studies, Public Health Service. However, they should be used with caution, particularly in evaluating the actual effectiveness of materials, he warned.

Rosenstock discussed two types of evaluation. One is pretesting while material is being developed to determine the best approach to the subject and to discover any misunderstandings, misinterpretations, or other barriers to successful communication. The second type is evaluation of effectiveness to determine how much a group may have been influenced in the desired direction.

### Pretesting

According to Rosenstock, the size of the sample to be used in pretesting depends upon the purpose of the test and the degree of intelligence, amount of education, and experiences of the group from which the sample is selected, the number of population variables relating to possible barriers to understanding, the degree of precision desired in measuring these barriers, and the homogeneity of the group to be reached.

As the heterogeneity of the intended audience increases, he said,

NONFAT DRY MILK IS WHOLE MILK  
FROM WHICH BOTH CREAM AND  
WATER HAVE BEEN REMOVED

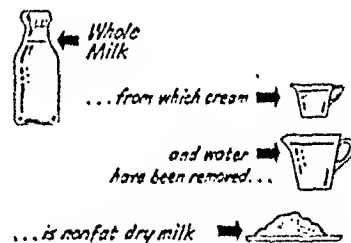


the size of the sample necessary for pretesting also increases, and the more barriers to communication to be identified, the larger the sample needed. Small samples are more likely to be adequate when they are composed of a homogeneous group of persons for whom the educational material is designed.

Among several examples which he cited, Rosenstock reported that pretesting a chart illustrating the relationship between whole milk and nonfat dry milk revealed that women with less than 8 years of schooling did not understand the minus and equals signs. One woman said the chart showed that "after you pour off the cream you have water." Another said that the minus sign showed how far the cream should be taken off the bottle. When the chart was revised, using words and arrows instead of algebraic signs, it was much better understood.

Pretesting a pamphlet recommending the use of salt-soda solution in place of blood plasma showed that most readers misinterpreted the meaning of shock and failed to associate the use of salt-soda solution with the treatment of burns. Several persons said that they would have the injured person drink the solution so that he would not feel shocked when he looked at his injuries, and one woman said that she would drink the solution so that she would not be shocked when she looked at the injured person.

Rosenstock said that any changes made in the material as a result of the initial pretesting must be tested on new groups, but care should be



taken that the meaning of the portions being retested is not altered by presenting them out of the original context.

### Evaluating Effectiveness

The use of sampling, in determining the extent to which educational materials achieve their purpose is a much more complex procedure than sampling in pretesting. Selection of the sample and the determination of criteria and measures of effectiveness present difficulties which, Rosenstock said, may require the assistance of experts in statistics and in the social sciences. Pretesting can be learned by public health workers and rarely requires the assistance of experts.

## Dental Health Programs Evaluated Objectively

The precise measures of dental caries available today provide the means for continuing objective appraisal of dental health programs, stated George A. Nevitt, D.D.S., M.S.P.H., in a review reemphasizing dental health program evaluation. Dr. Nevitt is regional dental consultant, Region IX office of the Public Health Service, San Francisco.

The appraisal, he specified, is dependent upon periodic age-specific comparisons of dental caries prevalence and tooth mortality. The basic measure is the DMF index, that is, the number of teeth decayed, missing or indicated for extraction, and filled.

Explaining how the DMF index is

used, he pointed out that a decrease in the DMF indicates success, for it shows that the prevalence and incidence of dental caries is being reduced. He noted also that changes in the components may indicate progress even though the total DMF does not change. A decrease in the number of permanent teeth lost would show a reduction in tooth mortality, he said. An increase in the F component would indicate that more needs are being met and therefore that future reductions in tooth mortality might be expected.

Already available or under study, Nevitt remarked, are measures applicable to phases of dental health programs other than dental caries control. He mentioned the graded classification system for measuring fluorosis, or mottled enamel, the PMA index for measuring severity of gingivitis, and the dentofacial index for measuring degrees of malocclusion.

Dental health programs can, in certain instances, be evaluated by subjective appraisal, Nevitt claimed. Whether or not subjective appraisal can be used legitimately, he indicated, is determined by the kind of planning done. For example, he said, when the effectiveness of a procedure such as topical fluoride application has been thoroughly field tested before it is introduced generally, the mere institution of the activity is a sign of progress.

Nevitt called subjective appraisal the most basic, simple evaluation technique available today. It requires no survey, no statistical measure, no clever devices, he said. It requires only a review of the previously prepared plan and the answer to the vital question, "Was this done?"

## Acceptable Planning

Because evaluation, of any type, is so dependent upon planning, Nevitt reviewed briefly the requirements of acceptable planning.

1. To accomplish a program objective, both long-range and intermediate goals must be planned.

2. A specific plan listing each intermediate objective should be prepared periodically.

3. Detailed procedural methods must be outlined for accomplishing each intermediate objective.

## Measure Gain in Learning In Workshop Tests

Student and faculty opinions regarding a student's contribution to a learning situation should receive greater emphasis, when it comes to grading, than the actual knowledge he gains, according to objective measurements. This finding was indicated in a health education workshop, according to John H. Shaw, Ed.D., professor of health and physical education, Syracuse University, and Andrew S. Coccarei, M.A., director of physical education, The Hills School, Huntington, N. Y.

Most of the students enrolled in the workshop were elementary school teachers or nurses. The students were divided into four small groups, each with a full-time instructor. About half the class time was spent in working in these groups; otherwise, the workshop met as one unit.

Attempts were made to evaluate the program statistically:

1. By measurements of the actual increase, or decrease, of knowledge through the use of pretest and post-test forms (A and B) of the Shaw-Troyer Health Education Test, a standard health knowledge test.

2. By determinations of the relationship which exists between peer and instructor ratings of the contribution of individuals to the workshop.

3. By determinations of the relationship which exists between health knowledge and the contribution of an individual to the workshop as measured by student and instructor ratings.

Fifty-nine students took both tests, which were corrected and returned to each one for discussion.

## Significant Correlation

The participants were told that the first test was to determine their present knowledge about health. When the second test was administered, they were told that it would measure the groups' gain in knowledge. Students were encouraged to do their best and were assured that the scores would not be used as a basis for grading.

The results of the two tests were assembled and compared as to raw scores and percentile rank.

Total group gain in both scores and percentiles were figured. These results tended to show a fairly consistent increase in the number of correct answers on the second test as compared with the first.

This increase was clearly evident in the 11.1 percent gain in percentile ranking on the second test, as compared with the first test, and the differences between the two scores are statistically significant.

There was an average gain in health knowledge per individual of 3.7 in raw score, and a total gain of 338.

In attempting to determine the relationship which exists between a person's health knowledge and his contribution to the workshop, each instructor, at the end of the sessions, rated his group in accordance with the contribution he thought each member had made. He was also asked to have each student rate all participants in his group.

Although the instructors had a little forewarning that they were to rate students, the students had none. Nor did they have a chance to collaborate in making their judgments. Replies were anonymous.

The mean for each individual in the group was computed, and members were then ranked in terms of their mean score. The product moment correlation of instructor ratings and mean peer ratings was then figured to determine the relationship between peer and instructor ratings of the individual's contribution. This correlation was highly significant, +.82, Shaw and Coccarei stated,

and it is on the basis of this finding that they recommend giving greater weight to student and faculty judgments as to an individual's classroom contribution.

By correlating the mean peer ratings and the results of the "before" and "after" tests, the authors found that there is apparently very little relationship between a student's gain in knowledge of health education, as measured by the objective tests, and the rating of his contribution to a learning situation, as measured by staff and fellow members. The correlation of mean peer ratings and scores was  $+0.38$  on the pretest and  $+0.01$  on the post-test.

## Urges Wider Application Of Program Evaluation

More and better applications of the evaluation yardstick to program progress and achievement were advocated by Andie L. Knutson, Ph.D., chief of Behavioral Studies, Public Health Service, and Benjamin Shimberg, Ph.D., Educational Testing Service, Princeton, N. J.

They described program progress evaluation as the step-by-step assessment of each new phase of a program to keep it headed toward the intended goal. This type of evaluation, they said, yields usable results when they are needed and helps increase the likelihood that the program will be effective.

Program achievement evaluation determines whether or not the goal has been reached, they explained.

The worth of decisions in either type of evaluation, Knutson and Shimberg pointed out, will depend on asking the right questions and recognizing the significance of relevant variables. This means, they said, differentiating fact from opinion, reliable data from guesswork, and assumptions and hypotheses from firmly established knowledge and principles.

Either type of evaluation can be applied independently of the other, or both may be applied concurrently,

even within the same study, they said.

### TV vs. Classroom

They gave us an illustration of dual application an evaluation of the effectiveness of television as a medium for teaching home nursing.

In a study sponsored by the National American Red Cross, one group of women received all their instruction through a series of 13 television programs in Houston, Tex. A second group took the same television course plus an additional hour a week in organized practice sessions; and a third group was instructed by the conventional classroom method, they reported.

A written test and a performance test revealed that all three groups learned about the same amount, regardless of the instruction method, although specific differences occurred. Thus, the evaluation of achievement showed that the teaching of home nursing by television was, in general, as effective as teaching in the classroom, they said.

Further analysis of the test data and inclusion of a questionnaire helped identify difficulties in course content, method, and focus for use in planning future programs and indicated the need of evaluation while a program is in progress, Knutson and Shimberg reported.

For example, they said, performance test data revealed that more than 40 percent of the women who had taken the classroom course, as well as those in the television-plus-practice group, could not read a clinical thermometer accurately. The TV-only group showed no improvement at all.

This finding, they said, clearly indicated need for further study and correction of this difficulty in planning future courses.

Their data suggested the need for making the practice sessions more effective, if they were to be retained; a change in TV program hours; coverage of the course within a month instead of 7 weeks; and inclusion of a course outline or study guide.

## Shows Way To Evaluate State Nutrition Program

A method of evaluating nutrition programs based on the intermediate goal of a wide use of nutritional knowledge was presented by John H. Browe, M.D., M.P.H., bureau of nutrition director in the New York State Department of Health.

Nutrition programs are very difficult to evaluate, according to Browe. Even evaluation such as he advocated is difficult for the New York nutrition bureau, he said, because the nutritionists there have only an indirect relationship with the people they hope to help. A large part of the bureau's work consists of consultations with other professional personnel who provide the actual services.

The bureau's immediate problem was to determine the effectiveness of its existing nutrition programs, Browe said. To find just what the bureau was doing, a review was made of the monthly reports by individual nutritionists and the monthly bureau reports for 1952, the last calendar year completed before the survey. A side result was that the study showed up the weaknesses of the reports and these inadequacies have now been changed.

### Classification Shift

The activities in these reports were arranged systematically according to the agencies, organizations, and persons with whom the bureau members worked. It was decided to change this classification by considering the activities in relation to the particular nutritional needs of the different groups of people actually served. For instance, the activity which in the past was recorded as participation in an institute for nursing home operators is now listed in the chronically ill category.

Considering the activity in this manner places it in proper perspective and stimulates thought about goals and objectives, Browe said.

A number of similar categories

have been set up. The first major division was between the well and the sick. The categories for well persons were based on age or physiological state—pregnancy, infancy, early childhood, late childhood, adolescence, adulthood, and old age. The sick are divided into the acutely ill, the chronically ill, the malnourished, and those with particular disabilities such as diabetes, obesity, or heart disease.

Browe expects to have, at the end of 1954, a complete record with sufficient incidental data to know all the bureau's activities for population groups. He hopes to relate this information to the entire need for such activities and, on the basis of this information, to determine the bureau's future program development. This analysis of available data should, in his opinion, provide a solid framework for evaluation on more objective lines.

## Program Tested

Browe offered one example of the application of this evaluation technique to an existing program for pregnant women:

The bureau's contact was with public health nurses who taught mothers' classes. Evaluation began by testing the nurses' knowledge of nutrition. Staff education for the nurses was planned by nutritionists on the basis of information gained from the tests. These nutritionists then observed classes taught by the nurses and asked supervising nurses for their opinions of the project. The nutritionists also asked the mothers attending the classes about their knowledge of nutrition. The nurses were asked to observe if any changes in nutritional practices took place in the homes.

Not all types of service offered by the bureau can be evaluated this easily, said Browe.

However, a clear understanding of the purpose of a program is necessary before any evaluation is possible, he continued. There must be a willingness to find out if the purpose has been accomplished. The

selection of an objective criterion is usually possible, he said, and it is upon this modest beginning that the evaluation of any nutrition program must depend.

## New Classification Scheme For CV-R Deaths Outlined

An attempt to classify deaths from cardiovascular-renal disease in rubrics said to give both an etiological and an anatomical description of the cause of death was reported by Louis Weiner, Marjorie T. Bellows, Grace H. MacAvoy, and Eli V. Cohen.

Miss Bellows is chief statistician, American Heart Association. Mr. Weiner, Miss MacAvoy, and Mr. Cohen are with the bureau of records and statistics, New York City Health Department; they are, respectively, chief, statistical division; nosologist; and administrative assistant, tabulating division.

The data used in the study were obtained from multiple-cause cards

prepared by the New York City Department of Health early in 1954. They relate to 2,587 certificates on which the underlying cause of death, selected by the conventional rules, was some cardiovascular-renal disease. The authors asserted that etiology and anatomical involvement could be determined for more than 99 percent of the certificates on which at least two cardiovascular-renal conditions were mentioned, and for 86.5 percent of the certificates on which only a single cause was mentioned.

The major changes resulting from the new classification, according to the authors, were (1) an increase in the number of deaths showing hypertensive etiology, and (2) determination of the etiology in more than three-quarters of the deaths ascribed by the International Statistical Classification to cerebral vascular lesions. The proportion of deaths unclassifiable as to etiology was particularly high in the cause-of-death groups involving nephritis.

## The Handicapped Child . . .

*Itinerant teachers bring the classroom to the home of the blind child; vision screening tests are found to place many in sight-saving classes who do not need it; some institutionalized orthopedic patients go home as a result of a review committee's recheck on status, and some guidelines are offered to help communities help mentally retarded children.*

## Care of Handicapped Reviewed by New York

Evidence that certain types of handicapped children in the New York City program have been over-institutionalized was presented by five members of the bureau for handicapped children of the New York City Department of Health.

Bureau surveys discovered that the orthopedically handicapped children cared for in hospitals and convalescent homes through the bureau's medical rehabilitation payment program were not receiving the optimum care needed for their treatment and rehabilitation and that they needed more careful and frequent evaluation.

Reporting the study were Helen M. Wallace, M.D., director, Robert S. Siffert, M.D., senior orthopedic consultant, Horace Yu, M.D., orthopedic consultant, Margaret A. Losty, R.N., coordinator of the hospital consultation program, and Helen M. Gossett, acting chief of medical social work, all of the bureau for handicapped children.

### Review Committee

Described in detail was one of the remedial steps taken to modify or change the services as the condition and needs of the patients changed. A review committee was formed to recheck primarily the status of all long-term handicapped children provided institutional care by the program.

During the first 6 months, June-December 1953, of the committee's work, records of 210 patients in 20 institutions were reviewed. Of the 10 institutions caring for 180 of the patients, 5 were classified as convalescent institutions and cared for 121 patients.

Inpatient care averaged 575 days per child and the program cost averaged \$4,205 per child. A total of \$883,091 had been authorized.

The review committee recommended the following changes for 100 of the 210 children: 48, return home; 37, screening for admission to special public school classes for cerebral palsied children; 8, transferral from hospitals to a convalescent institution; 2, foster home placement; 2, admission to the State institution for the mentally retarded; 2, transferral from convalescent homes to a hospital; and 3, admission to a residential school for the blind.

The demonstrated value of this approach has led to the review of the records each 6 months, the bureau members said.

### Consultation Program

In conjunction with the review activities, they reported, the bureau has developed a hospital consultation program designed to assist the

participating institutions in improving patient care. In addition to better care, they pointed out, the information about the patient and a working knowledge of the institution gained through the consultation program has helped the review committee operate.

The review committee's activities, they believe, may reshape community services for handicapped children. The end result may be fewer inpatient beds in hospitals and convalescent homes, strengthened outpatient services, and more public school classes for children with cerebral palsy and other orthopedic handicaps, they said.

Also likely, they stated, is a reevaluation of convalescent care—the type of inpatient services the convalescent home should provide and whether alternate services, such as a foster home program and better housing, should be developed.

### Would Overhaul Criteria For Sightsaving Classes

Criteria used for the selection of children to be placed in sightsaving classes were disputed on medical grounds and on the basis of experience with 500 or more visually handicapped youngsters by Ralph C. Lanciano, M.D., LL.D., chief ophthalmologist for the Philadelphia Board of Public Education, and an instructor in pediatric ophthalmology at the University of Pennsylvania Graduate School of Medicine.

Lanciano saw no reason for assigning a child with usefully corrected vision to a sightsaving class if he can recognize blackboard writing from a reasonable distance and can read textbook 12-point type without difficulty. He based his opinion on a study of all children excluded for admission to sightsaving classes in Philadelphia for the last 3 years.

Many State and city regulations governing the placement of visually

handicapped children, he said, are outdated. The criteria established by these regulations are impractical and unrealistic by modern ophthalmological standards, he continued.

### Modern Concept

Lanciano objected to the method of relying on a child's recognition of test types on the Snellen chart to determine his power of vision. The child's response, according to Lanciano, depends on a number of factors in addition to his visual acuity. His power of attention, his willingness to cooperate, and his reading ability must be taken into account. It is also necessary, Lanciano said, to consider the competence of the child's nervous system to transmit images from the eye to the visual area in the brain.

The regulations of two States, New York and Ohio, recommend special classes for children who, after correction, are unable to read 5-point type, said Lanciano. But elementary and high school textbooks are rarely, if ever, printed in a type less than 12-point, according to Lanciano. He considers children visually handicapped if adequate correction doesn't enable them to read 10-point type.

Lanciano also disagrees with those regulations which call for special treatment of children if they have 20/70 corrected vision in the better eye. A child with this defect, he said, doesn't recognize images less than 1½ inches high from a distance of 20 feet. Legible blackboard writing, he continued, doesn't include letters smaller than 1½ inches in height, and modern classrooms can solve the problem by seating adjustments.

The idea behind many of these regulations, said Lanciano, is that sightsaving classes can retard, arrest, or ameliorate the pathological processes. He claimed, however, the greater majority of the clinical entities noted in children attending these classes are determined by heredity or by degenerative, con-



genital, or maldevelopmental processes, none of which are subject to environmental control.

The decision to place a child in sightsaving classes should not be based on the degree of visual loss or on a clinical label, said the speaker. Instead one should determine how much visual function remains and what the child can do with it in terms of the curricular demands of regular education.

## Community Planning Urged For Mentally Retarded

Comprehensive planning by the community to deal with the problem of mental retardation, with leadership provided by public health workers, was urged by Joseph Wortis, M.D., director of pediatric psychiatry, Jewish Hospital of Brooklyn.

Public health workers can be especially useful by sharing with parent groups the modern scientific knowledge needed to cope with the problem, he said, pointing out that parent groups tend to become focal points of activity in this field.

Although institutions for the care of severely retarded persons will continue to be needed, the future development of work in this field demands increased attention to the encouragement of community facilities, Wortis said. Institutions, he added, should aim to return as many children as possible, as soon as possible, back to the community.

He reported that an estimated 60 to 80 percent of the patients of the Jewish Hospital's retardation clinic could, under favorable circumstances, perform socially useful work in a supervised setting. During recent years, he stated, institutionalization has been recommended for only 24 percent of the children seen at the clinic. The figure would have been lower if suitable family or community arrangements had been available, he maintained.

## Recommended Approach

Stressing the need for close integration of educational, recreational, medical, and vocational services for the mentally retarded, Wortis made the following general suggestions:

1. Appropriate schooling should be provided for all retarded children, except the very few incapable of learning.

2. Many mildly retarded children, especially the large number who can be described as educationally underprivileged, will do much better in classes with normal children than segregated, if the classes are small enough to allow teachers to give them the consideration they need.

3. Classes for the more retarded should be even smaller.

4. Special schooling need not be limited to ordinary academic training.

5. All-day schools should be made available to children needing care and supervision which their families cannot provide.

6. Diagnostic and rehabilitation clinics must be more widely established, preferably in a hospital setting where teams of workers may study the children and assist in their rehabilitation.

7. Distressed and overburdened families need the enlightened help of social agencies.

8. Vocational training and vocational placement under suitable safeguards must be provided for the older children.

## Scope of the Problem

Wortis estimated that 3 percent of the children in this country, about 700,000 of the children attending school today, are likely to require special educational help because of mental retardation. However, only about 115,000 children are attending special educational facilities, he said, stressing the difficulty of making any statistical estimate of the scope of the problem because of the lack of reliable data and the wide variation in definitions of terms.

The uncritical use of mental tests

has served to perpetuate some misconceptions concerning the nature of mental retardation, particularly mild retardation, Wortis declared. Since all mental tests are tests of performance and performance is the result of both innate capacity and previous training, he said, it can be seen why socially deprived persons, who tend to score low on the tests, have often been falsely regarded as biologically defective.

On the other hand, Wortis continued, there are many persons whose biological deficiencies are not given the special consideration they demand. He mentioned mongoloids as one group and indicated that many mongoloids could benefit from family life and from special training in their own communities.

## Lists Education Trends For Blind Youngsters

How are present educational trends enriching the lives of blind children? What of the future of these children?

Three basic, but greatly varying, patterns are followed in the education of blind children, Georgie Lee Abel, M.A., consultant in education, American Foundation for the Blind, New York City, said, in discussing the gains being made toward the effective functioning of the future blind adult.

The newest is the itinerant plan, which makes it possible for an occasional blind child to remain in his own school district and have necessary services brought to him by qualified teachers or consultants, Abel explained. This system is found where there are not enough pupils to justify the expense of a teacher and a specialized program. Where it is constructively set up, it works well for older children, she continued.

Education in a residential school for the blind and specialized programs or braille classes in the public schools are the other typical pat-



terns, Abel said. The former is recognizing the significance of more constructive home and school relations for the isolated child. The latter is turning into the "resource room" where the blind child is enrolled in the regular class and returns to the specialist teacher for help when necessary. The resource teacher is available to other teachers who have blind children in their classes. She prepares comparable text and reference materials in braille for the blind children, actually teaches them certain skills, and counsels their needs.

### *Gains of the Present*

In listing some of the professional gains, Abel said that the future should seek to free blind individuals from many of the past prejudices of their sighted friends who still find it difficult to react with respect and understanding. Her list included these main points:

1. The establishment of more pre-school programs for blind children represents perhaps the greatest single step in more effective educational planning in their behalf.
2. The greatest contribution of the present can be found in the parents, who, when given sufficient help as soon as needed, are showing that they are capable of accepting and understanding their children.
3. Important sociological and psychological research has been most productive, as to parent-child relations, adjustment to blindness, emotional needs of blind children, and so forth.
4. Teacher preparation facilities are improving; teachers are showing a capacity to accept the responsibility for planning constructive courses.
5. More cooperative planning is being accomplished at the State level in the interest of screening, case finding, and evaluation of the most effective placement.
6. General health and welfare agencies are expressing an increased desire to serve blind children and their families.
7. Through the process of study, action, and practice, carefully de-

veloped legislation is being achieved which will affect and aid blind as well as other handicapped children.

### **Offers Checklist as Aid To Program Planning**

A checklist to help a community organization evaluate its position in the community and to determine its offering toward a proposed program was presented by Louis Spektor, M.D., M.P.H., director of the bureau of maternal and child hygiene, Connecticut State Department of Health, during his discussion of ways to get maximum use of available community resources in giving aid to children with orthopedic conditions.

Some of the items to be evaluated for a program include purpose and objectives, types of services needed, standards for the conditions to be served, geographic area, estimated number of persons to be served, source of funds and budget, personnel needed, personnel available, and

additional personnel to be recruited.

With a clear picture of the facilities available and of the program to be superimposed, the community may develop the program for the handicapped children upon a set of major principles which Spektor itemized:

1. Base planning upon the knowledge of the extent and nature of the problem.
2. Define the program and its limitations.
3. Set up a list of priorities.
4. Integrate the special services with overall health services.
5. Focus the program on the individuals for whom it is provided.
6. Give the local community a chance to assume as much responsibility for providing services as is possible.
7. Secure professional leadership to assure a high quality of services.
8. Provide for demonstrations and evaluations.
9. Encourage and make an opportunity for individuals and groups to participate.
10. Briefly and clearly put the plan in writing.

## **Amebiasis, Infantile Diarrhea . . .**

*Two amebicides are found effective in an Indiana outbreak; resuscitating equipment in a hospital is linked to the spread of diarrhea among the newborn; a fluorescein derivative opens the way to a possible new method of diagnosing amebic dysentery; and two reports are made on the potentially pathogenic characteristics of Escherichia coli O111.*

### **Amebic Dysentery Work Gets a Green Light**

The diagnosis of amebic dysentery by means of fluorescent antibodies is promising although the method remains to be perfected, according to a report made by Morris Goldman, Sc.D., director of the Intestinal Para-

sitology Laboratory at the Communicable Disease Center, Public Health Service.

Amebic dysentery is difficult to diagnose in any temperature climate, he continued, since the classic picture is rarely present, either clinically or parasitologically. In many cases, it is difficult to distinguish the

causative organism of the disease, *Endamoeba histolytica*, from a harmless organism commonly found in the intestinal tract of man, *Endamoeba coli*. The parasitology laboratory is particularly interested in developing objective criteria for differentiating the two organisms.

## Recent Development

The staining of antigen with antibodies tagged with fluorescein is a development based on the work of Coones and Kaplan in 1950. Antiserum for the antigen under investigation is obtained in the usual manner and is tagged with a fluorescein derivative. An antigen-antibody reaction is then produced. The product of this reaction can be seen in minute quantities because it emits a green fluorescence when exposed to ultraviolet light.

The fluorescence can be detected easily against the dark background with an ordinary microscope fitted with appropriate filters and illuminated with intense ultraviolet light, Goldman said.

Application of this method to the identification of cultures of *E. histolytica* and *E. coli* was described in recent papers by Goldman. In these he indicated that when cultured individuals of the two intestinal *Endamoeba* were mixed in a single tube, the fluorescent antibody method made it possible to distinguish the organism which causes amebic dysentery from the harmless parasite.

## Latest Studies

In the present paper, Goldman presented preliminary results obtained in the last few months. All previous work had been done with two species of amebae—the harmless and the harmful—grown in separate culture media and maintained in this way for a long time—in some cases for many years.

The present research was aimed at determining if the same results could be obtained with newly started cultures of amebae taken directly from the intestinal tract where, per-

haps, the two species had been living together.

Accordingly, a collection of fresh stool samples was made. Those showing *Endamoeba* trophozoites or cysts were inoculated into culture media. Of 30 cultures inoculated, 11 were considered suitable for staining with fluorescent antibody to *E. histolytica* and *E. coli* within 3 days. An additional culture was stained one week after inoculation.

Emphasizing the practical importance of this experiment, Goldman found that it was possible to work with newly started cultures. In fact, he continued, the 48- and 72-hour cultures of the original inoculum frequently showed more amebae than later transfers. This did not mean, he added, that distinctions between the two types of freshly isolated amebae were always clearcut or easy to make. Though the results are encouraging, Goldman pointed out that there are indications of strain differences and that amebae of one species did not fluoresce to the same degree in different cultures. He said the test tube methods are too cumbersome and that work is progressing on staining smears.

The fluorescent antibody method of diagnosing intestinal amebae is not expected to replace other diagnostic procedures, he said. But he hopes that the method will become another valuable tool in the hands of parasitologists and technicians.

## Believe Infantile Diarrhea Has One Etiological Agent

Recent evidence indicating that *Escherichia coli* O111 is the sole pathogenic agent of acute infantile diarrhea was said to be reinforced by the study of an outbreak of the disease at the U. S. Army Hospital in Fort Belvoir, Va.

The study was reported by Lt. Col. Robert B. Lindberg, MSC, USA, Viola M. Young, Ph.D., bacteriologist, and Joel Warren, Ph.D., chief,

all of the department of bacteriology, Army Medical Service Graduate School, Walter Reed Army Medical Center, and by Capt. W. D. Belnap, MC, USA, chief, pediatrics section, Fort Belvoir Station Hospital.

A total of 51 cases were hospitalized at Ft. Belvoir during the epidemic which reached its peak in December 1953 and virtually disappeared in February 1954, according to Lindberg and his associates. Patients under 1 year of age comprised 94.1 percent of the cases.

The epidemic, they said, was typical in its failure to affect breast-fed infants or to cause serious illness among older children. The overall mortality rate for the hospitalized cases was 15.7 percent, but for babies 28 days old or younger, it was 40 percent.

## Unknown Virus

The causal relationship of *E. coli* O111 to epidemic diarrhea of the newborn has been established in previous research, Lindberg and his co-workers continued, but the existence of an unknown virus as a concomitant etiological agent has often been suggested, and previous studies haven't eliminated that possibility.

In the present study stool and vomitus specimens of infants in an acute phase of the disease were subjected to laboratory examinations. *E. coli* O111 was recovered, often in virtually pure culture, from 90 percent of the cases cultured. The organism was also recovered, though infrequently, from adult carriers and contacts. Emphasis was placed on newer test techniques including tissue cultures, they said, but no viral agents were recovered.

Although they pointed out that negative results can never, in a sense, be absolute, Lindberg and his colleagues felt that their series of negative isolation attempts strengthen the idea that *E. coli* O111 may act as the sole etiological agent of infantile diarrhea.

The bacteriological aspects of the study resembled descriptions of other

epidemics—patients did not respond well to antibiotics. Considering recently reported success with neomycin, the drug of choice here, they said, may be only approximately indicated by *in vitro* tests.

The report went on to make the following points:

A low titer but significant agglutinin rise to *E. coli* O111 was shown in convalescent serums of 85 percent of patients examined, in contrast to earlier observations of absence of serologic response in this condition.

Cultural reactions of 87 strains showed small but significant numbers of strains varying from the basic pattern of delayed sucrose, salicin, and sorbitol fermentation. Eighty-three percent of the strains were hemolytic.

Indication of heightened toxicity for mice was obtained.

Schwartzman reactions, both systemic and cutaneous, were carried out, and a heightened tissue sensitizing and reacting potential was demonstrated for the O111 strains over those of control strains of *E. coli*. The possibility is present that absorption of sensitizing antigen with subsequent contact with the coliform strains may suffice to set up the fatal hemorrhagic reaction in infants.

## Colorado Study Indicts 4 *Escherichia Coli* Types

The isolation of 4 colitypes—*Escherichia coli* O111, O55, O73, and O86—from infant diarrhea cases in Denver supports the theory that *E. coli* is causing infantile diarrhea, according to Maj. C. D. Graber, M.S., bacteriologist at Fitzsimons Army Hospital, Denver.

In all, 128 diarrhea cases were found among 538 pediatric and nursery cases studied in Denver hospitals during 1972 and 1973. Of significance, Graber said, was the fact that no suspect *coli* pathogens were recovered from the normal stools of the remaining 410 children.

Graber told how the yearly out-

breaks of enteric disease in Colorado led to a search for the suspect organism. A 15-month study was undertaken in Denver to determine the occurrence of possible pathogenic *coli* in all pediatric admissions, regardless of diarrhea.

### The Study

The study started with 33 cultures from diarrheas at Colorado General Hospital. These had been saved for typing, Graber explained. Most of the other cultures represented unselected sampling, he said.

At Fitzsimons and Colorado General, cultures were procured at intervals from all patients without regard to illness, he continued. At Children's Hospital and the Florence Crittenton Home, specimens were taken on all frank cases of diarrhea. Cultures were obtained by rectal swabs and examined for nondigestive fermenting enteric pathogens and suspect colitypes.

Although the rectal swab technique is excellent for *Shigella* work, Graber feels that the method fails to reach the most favorable fecal areas and that this may account for the low incidence of pathogenic colitypes he encountered.

*Salmonella paratyphi*, *Shigella flexneri* 3, and *Shigella sonnei* 1, Graber said, were the only established enteric pathogens isolated from the diarrhea cases, which were of more than mild character. The 4 colitypes were cultured from 4 diarrhea specimens, he continued. All were from male cases, and all except the O73 came from children under 1 year.

## Incriminate Resuscitators in Salmonellosis Spread

Diarrhea epidemics among newborn infants can in some instances result from infectious spread by the resuscitators used to administer oxygen and carbon dioxide and to apply artificial suction to the babies, said A. Daniel Rubenstein, MD, MPH,

director of the division of hospitals, Massachusetts Department of Public Health, and associate clinical professor of epidemiology, Harvard School of Public Health.

Rubenstein also stated that, contrary to generally accepted opinion, some types of infectious diarrhea contracted in hospitals can be transmitted from infants to older children and adults at home. However, the resulting illness, which may be serious for the newborn, is only rarely noticeable, and then in a mild subclinical form, among household contacts. This indicates a marked susceptibility of newborn infants to organisms that are relatively harmless to older children and adults—a fact which must constantly be remembered, Rubenstein warned.

He reported the findings in two outbreaks of infectious diarrhea caused by *Salmonella* organisms. The resuscitator was considered a source of infection after an epidemic of salmonellosis persisted in one hospital despite a quarantine of sick infants and the sterilization of every other piece of obstetrical and nursery equipment. Tests by the diagnostic laboratory of the Massachusetts Department of Public Health isolated *Salmonella montevideo* from the water trap of the resuscitator. The same species had previously been recovered from infants affected by the disease, Rubenstein said.

### Polluted Air

An examination of the resuscitator showed that no provision had been made to prevent a contaminant in the water trap from escaping into the atmosphere with air exhausted from the apparatus. This made it apparent, Rubenstein continued, that contamination of the fluid in the trap had resulted in a spray of *Salmonella* organisms into the atmosphere of the delivery room when the resuscitator was being used for suction.

An outbreak of salmonellosis at the second hospital also appeared to result from a contaminated resus-

citator. Another species, *Salmonella bacilly*, was recovered in pure culture from the machine's water trap and also from sick infants.

Two factors associated with the epidemics made it probable, said Rubenstein, that the resuscitators were responsible. In both hospitals, the incidence of illness among exposed infants was high—52 percent in the first and 82 percent in the second. This suggested widespread distribution of the infectious agent. In both outbreaks, the interval between birth and the onset of illness was short enough to indicate that infection might have occurred at delivery or a short time later.

## Steps Taken

A series of cultures taken by the State health department in the course of regular hospital inspections showed that contamination of resuscitator water trap fluid was not infrequent. Quantitative analyses of organisms isolated by cultures often resulted in very high bacterial counts, according to Rubenstein. Since delivery room supervisors were completely unaware of danger from this source, the water traps were sometimes washed after use but seldom sterilized. Rubenstein said that the problem has been brought to the attention of manufacturers of resuscitating equipment.

Bacteriological study of resuscitators also revealed frequent contamination of catheters and face masks. Rubenstein suggested that this finding indicated a need for greater care on the part of delivery room supervisors and hospital administrators.

## Amebacides Pass Test In Indiana Outbreak

Two amebacides, oxytetracycline and fumagillin, were found equally effective when tested under ideal conditions during a 1953 epidemic of amebiasis in South Bend, Ind.

Reporting this result were Robert

W. Sappenfield, M.D., instructor in the departments of preventive medicine, public health, and pediatrics, Louisiana State University School of Medicine, William M. Frye, Ph.D., M.D., professor of tropical medicine and dean of the same institution, F. R. N. Carter, M.D., South Bend city health officer, Carl Culbertson, M.D., acting director of the South Bend Medical Foundation, and two members of the Public Health Service Communicable Disease Center staff, Marion M. Brooke, Sc.D., chief of Parasitology and Mycology Section, and F. M. Payne, M.D., epidemic intelligence service officer, Enteric Disease Laboratory.

The outbreak of amebiasis, probably caused by the contamination of a private well, affected more than 800 employees of a woodworking plant, they reported. To avoid further spread of infection, the plant's source of water was changed to the municipal system before the scientists began their study.

The large number of people involved and the removal of the primary source of infection made the situation ideal for testing purposes. Previous evaluations, they said, were retarded by the necessity of treating a small number of people at one time or, if the groups were large, by the continued possibility of heavy, prolonged exposure to infections in such places as mental institutions and prisoner of war camps.

Sappenfield and his associates said that another ideal test condition was the apparent widespread infection with the same strains of *Endamoeba histolytica*. The organism had caused death and severe illness as well as asymptomatic infections among persons affected by the epidemic.

## Drugs Used

Oxytetracycline, they reported, was shown by Frye and his co-workers in Korea to be the most effective single agent then in use for the treatment of amebic dysentery. It was chosen for the present study to confirm its effectiveness on a

great number of asymptomatic cases and also because conditions in South Bend permitted a longer followup period than was feasible in Korea.

Fumagillin was previously tested in the laboratory and on small groups of patients, they said. The present research project was its first comparison on a large scale with an agent known to be useful against amebic dysentery.

Of the 1,561 plant employees involved, 1,542 contributed specimens for examination and 52.4 percent were found to be harboring *E. histolytica*.

A checkup made 3 to 4 months after the drugs had been evenly distributed among the test group showed that *E. histolytica* had disappeared from the gastrointestinal tracts of 94.4 percent of those who had received oxytetracycline. Fumagillin, they reported, gave similar results in 93.8 percent of the patients treated. No evaluation of therapy for extra-intestinal amebiasis could be made. The number of patients who complained of reactions to therapy was approximately the same with both drugs, the research group reported. For the most part, they said, these complaints were mild and disappeared when treatment was completed.

## Trace Amebiasis Outbreaks To Factory's Wells

Chlorination of drinking water won't prevent disease outbreaks if badly constructed or located wells are contaminated by nearby sewers, according to three members of the Indiana State Board of Health who reported tracing a 1953 amebiasis outbreak to a chlorinated well water supply in a South Bend factory.

The project was discussed by Andrew C. Offutt, M.D., State health commissioner, B. A. Poole, B.S.C.E., director, bureau of environmental sanitation, and George G. Fassnacht, M.C.E., chief, water supply section.

Amebiasis, they explained, is used as a general term for all *Endamoeba histolytica* infections including amebic dysentery and related but less serious conditions. Waterborne amebiasis epidemics are rare in this country, they said, and acceptable chlorination procedures are sufficient protection against fairly common bacillary dysentery and coliform organisms but have no effect on *E. histolytica* cysts.

When Offutt and his associates found that 31 of 46 amebiasis cases in the South Bend area occurred among 1,500 employees of one factory, they concentrated their study on the plant. A sample survey of approximately 10 percent of the employees showed that a little more than half were harboring *E. histolytica*. Contamination of water and milk supplies at the employees' homes and of food served at the factory was ruled out by extensive investigation, Poole and his co-workers reported. They examined other possible sources of infection but obtained no significant data.

### Dye Test Used

Thus by exclusion, they said, the most probable cause of this outbreak was contamination of the plant's private water supply. The contamination was clearly shown, they reported, when dye placed in a sewer for experimental purposes appeared in the well water. Examination of the well apparatus, made as a result of the dye test, uncovered leakage in a pipe between the vertical turbine pump and a receiving tank into which the pump discharged well water under atmospheric pressure. The pipe was only five horizontal inches from the sewer, said Offutt and his group.

### Unusual Epidemic

Characteristic outbreaks of amebiasis, they said, are explosive in nature, affect a relatively large percentage of the exposed population, and are preceded by abnormal diarrheas if the major infection is one

with more severe symptoms. The South Bend epidemic, however, was sporadic, confined, and often mild.

Although cases appeared as early as 1950, Offutt and his associates said their final tabulation shows there were never more than 1 to 2 new cases in any 1 week and only 22 cases during the 15-week period in 1953 when the epidemic was at its height. Clinical symptoms of amebic dysentery didn't always appear in infected individuals, they reported, but said that a majority of the cases

under study were characterized by bowel movements numbering from six a day to fecal incontinence.

The outbreak was obscure in its early phases and there was a lack of immediate correlation between health department reports and the actual date of onset in many cases, said the Offutt group. As a result the existing epidemiological evidence was misleading and a retrospective study became necessary when the epidemic was recognized in June 1952.

## Planning and Administration . . .

*Undergoing constant reassessment is the extensive range of basic services provided by local and State health departments. Some of the refinements in program administration that have been developed are reported here.*

### Sanitation Programs Need Reappraisal

Local sanitation programs today are not being directed to the more serious health problems, according to Charles C. Spencer, M.C.E., director of the division of environmental sanitation, Erie County (N. Y.) Health Department.

In Spencer's opinion most such programs are still directed toward control of gastrointestinal diseases, which are now negligible in the United States, in spite of the fact that respiratory diseases make up a large proportion of the communicable diseases today. Home nee-dents require more attention, though it is difficult to define the usefulness of environmental measures to prevent them, he said.

### Cooperative Planning

To best contribute to the long-term development of an area, public health

engineers in health departments must work very closely with local officials, and particularly with planning boards, Spencer declared. Although enforcement activities should not be neglected, time devoted to encouragement and development of communitywide sewer and water facilities or to the stimulation of voluntary housing improvement programs should be more valuable and productive in the long run, he added.

Sanitation workers in health departments as well as sanitary engineers must participate in community planning and design if their objectives are to be accomplished, Spencer continued.

"Ideally, one man should cover all aspects of sanitation in a limited district," he said, for by so doing "he becomes more familiar with local officials and with the needs and customs of a particular neighborhood which influence all aspects of sanitation. However, from a point of view of ad-

ministration and program direction, specialization in certain aspects of the work appears to be desirable."

The size of a staff should be based on density of population and the type and extent of the problems in an area rather than on the total population, Spencer stated.

Public demand for the services of a sanitation division is increasing, and although some of the community's problems are not always of immediate public health importance, the sanitation division is the only public agency organized to deal with them. On that basis, he purposes, that for administrative reasons it is probably well for the sanitation division to assign needed personnel to the health department. However, he cautioned, there should be an awareness of real public need as contrasted with public demand.

## Nurse Services Evaluated By New Record System

The mark sense system of reporting and tabulating nursing activities in the Erie County (N. Y.) Department of Health serves as an index of problem situations, according to Mary E. Jones, M.S., the department's assistant director of public health nursing.

The system, installed in 1951, is used to plan and evaluate programs, to adapt nursing services to community needs, and to supervise nursing performance, Jones stated. It has reduced the amount of nursing time spent on clerical work. About 10 to 12 thousand cards are handled monthly.

The new system is now being used for a 4-year study of a community by nursing area, Jones said. Data were collected on birth and death rates, population shifts, health services utilized, type of nursing service, and nurse performance. Analysis has brought about a concentrated effort on individual nursing contacts in certain census tracts. The study has served to emphasize services for pre-school children, too.

Eventually, each nursing district will have similar information in looseleaf form, which will be kept up to date, she added.

The objective data collected makes it possible for the nursing supervisor to anticipate workloads, Jones continued. It has helped justify the demand for increased bedside nursing in one rural district, she said. Statistical tabulation of reports on nursing visits has produced a baseline of performance for the average nurse within each district, as well as baselines for field visits and school and clinic visits, she said. These are only quantitative, she cautioned, and must be used with other pertinent factors for evaluation.

The system operates as follows, Jones said:

The nurse checks the information concerning the specific activity performed on an individual card for statistical use. With the addition of the nursing notes pertaining to the content of the activity, a duplicate card becomes the service record.

All districts use the same card for reporting, punched by nurse number and card number before distribution.

After mechanical tabulation of the statistical cards, a report is available, monthly and quarterly, for each nursing district. It is tabulated on an administrative basis and on a service basis.

On an administrative basis, it shows the work performed by all nurses for a particular district office regardless of the district in which the service occurs.

On a service basis, it shows the amount of nursing work performed in a given district by any nurse.

## Detroit Cites Advantages Of Centralized System

Continuity of patient care and administrative economy and efficiency mark Detroit's centralization of all municipal health functions within the health department, according to

Joseph G. Molner, M.D., M.P.H., and Vlado A. Getting, M.D., Dr.P.H.

Detroit's gradual consolidation of health functions is contrary to what they see as the prevailing trend of assigning health activities to several agencies.

Dr. Molner is commissioner of the Detroit Department of Health and professor of preventive medicine, Wayne Medical School, and Dr. Getting is professor of public health practices, University of Michigan School of Public Health.

In addition to the usual public health activities, they reported, the Detroit Department of Health administers the three city hospitals operated for the care of the needy sick and for emergency cases—the Herman Kiefer Hospital, containing the new 250-bed tuberculosis unit, and the contagious disease and maternity units; the Maybury Sanatorium for the tuberculous; and, since 1949, the 538-bed Receiving Hospital, and its 48-bed emergency branch, containing the general, psychiatric, and emergency units.

The consequent integration of hospital and medical home care for the indigent with the preventive program of public health is profitable to the city at large, the immediate recipients, the city officials, the practitioners, and the health department staff, Molner and Getting declared.

### *Continuity of Care*

As an example of program continuity, they cited tuberculosis control. The health department tuberculosis coordinator, they explained, is concerned with the entire program—case finding, health education, sanatorium admission, care, and discharge, and followup of the patient after discharge.

Prompt hospitalization of newly discovered cases, rapid examination of contacts in the hospital clinics, ease of transfer from the Maybury Sanatorium to the Herman Kiefer Hospital for surgery and back according to the patient's needs, earlier return home for continued anti-

microbial treatment when suitable, and periodic reevaluation in the outpatient clinic by the same agency—these were given as advantages accruing from undivided authority.

In addition to the secondary prevention measures of early detection and health education, Molner and Gettling said, the Detroit Department of Health can practice primary prevention through BCG vaccination of newborn infants arriving at the maternity unit and by followup in the well child conference and in the tuberculosis outpatient clinic. These prevention measures reach a medically indigent group in which tuberculosis is more prevalent than in other groups in the city, they said.

Among the administrative advantages, they said, are the uniformity of personnel policies and records for the public hospitals and health divisions, pooled purchase of supplies, and centralized ambulance and similar services.

The potential problem in the division of the health officer's time between hospital administration and public health practice is minimized by the employment of administrative specialists, Molner and Gettling indicated.

## Cautions Against Transfer Of Sanitation Inspections

The sanitation inspection program is a health department function and its transfer to other municipal agencies is at the jeopardy of health protection, the Committee on Municipal Public Health Engineering stated in its report.

Presenting the report was P. W. Purdon, director of environmental sanitation, Philadelphia Department of Public Health.

Improved administration of sanitation inspection programs can be achieved through better use of trained personnel within the health department and through the development and acceptance of reciprocity

of inspections between health jurisdictions, the report stated.

The committee considered three problems in the administration of local health department sanitation inspection programs: transfer to central agencies outside the health department; generalization versus specialization within the health department; and overlapping inspections between health jurisdictions.

The report, in summary, stated the following:

Transfer of sanitation programs from health to other departments may result in loss of effectiveness in protecting public health.

Actually, consolidation of inspection activities does not take place when a central inspection agency is established because of technical complexities.

Sanitation programs function most efficiently and effectively under professional supervision charged with the primary responsibility to protect the public health.

Generalization of sanitation personnel within the health department can be utilized to a greater extent than previously practiced. Thus reduction of annoying duplication and improved efficiency of operation can be obtained.

Development of reciprocal inspection programs between health jurisdictions in an area where duplication of effort can be eliminated without hindering public health objectives. This deserves further study and implementation.

## The Sanitary Engineer In Public Works

How sanitary engineers in health departments contribute to the conception, design, improvement, and operation of public works in municipalities was described by Harold Romer, chief, division of waste disposal and pollution control, New York City, and Rolf Ellussen, professor of sanitary engineering, Massachusetts Institute of Technology.

Aroused by failures of home sewage systems installed since 1946, the New York City Department of Health in 1952 took over active supervision of home sewage disposal installations through an interdepartmental committee.

Another example of interdepartmental action described related to the special board created at the suggestion of the health department in 1943 to protect the public water supply of New York City.

The economies of large-scale operation of sewage treatment plants suggested further opportunities for health departments to require essential hydrographic studies and biochemical assays prior to approval of plans.

Brookline, Mass., was cited as an example of a municipality where public health engineering, backed by inspection and police powers of the health department, succeeded in improving waste disposal operations involving an incinerator and a land-fill.

In relation to the budget, Romer and Ellussen stressed that the engineers of the health department can be particularly helpful to other departments in demonstrating and justifying the need for funds adequate to employ trained personnel, to conduct studies essential to economical operations, to provide an adequate maintenance staff, and to operate important control devices.

They cited a common condition: lack of funds for maintenance of devices that prevent sewer overflow. Raw sewage then passes the obstructed control gates; the waters are polluted, and the greater part of the investment in the treatment plant is wasted.

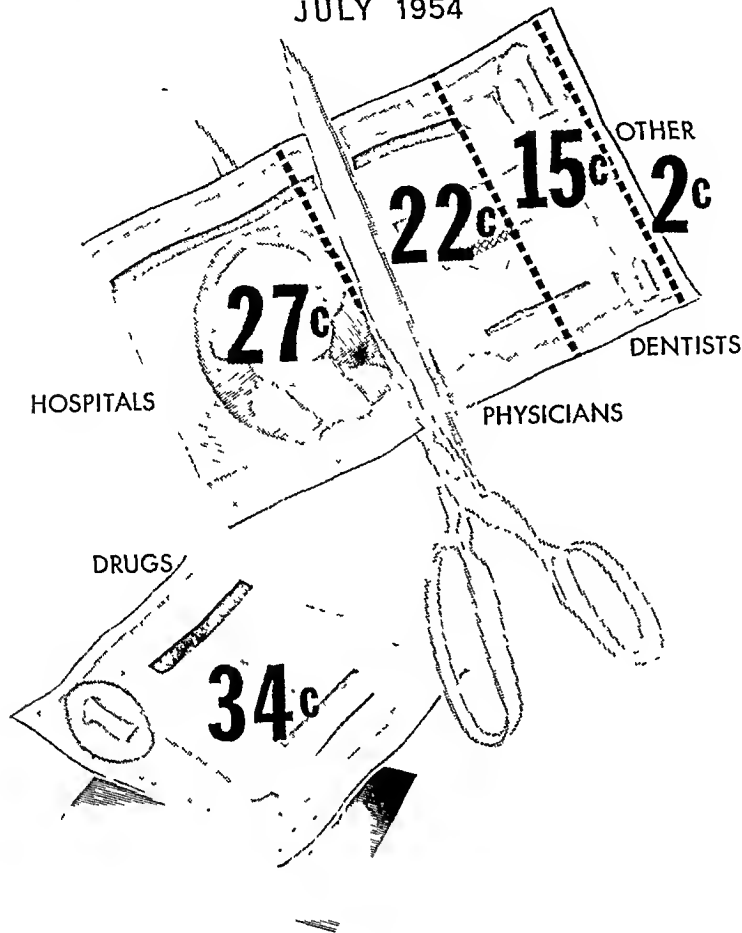
## Rhode Island Stresses Basic Low Cost Care

Rhode Island emphasizes minimum adequate medical care for its public assistance recipients, according to P. Joseph Pesare, M.D., Dr.P.H., medical director, and John T. Tierney,



# The Medical Care Dollar

RHODE ISLAND PUBLIC ASSISTANCE  
JULY 1954



medical social work supervisor of the office of medical service, Rhode Island Department of Social Welfare.

In July 1954, a total of 31,240 public assistance recipients, 3.9 percent of the 1950 State population, were receiving medical care at an annual expenditure of about \$1,300,000, Pesare and Tierney reported.

They explained that the medical care program is financed from a "pooled fund" made up by drawing from assistance funds a monthly amount for each assistance recipient. Federal participation in this pooled fund amounts to about 25 percent, they said. The monthly assessments per person or case in the Federally

aided categories are: old-age assistance, \$5; aid to dependent children, \$7; aid to the blind, \$6; and aid to the disabled, \$9. The State public assistance office pays the sources of services and supplies directly from the fund, they explained.

## Minimum Adequate Care

Under the heading of "adequate" care, they said, is an extensive range of basic services and supplies provided within the framework of conditions set down by the department.

Listed were the services of private physicians, medical consultants, dentists, osteopaths, optometrists, opticians, and chiropodists, and diagnostic X-ray and X-ray and radium

therapy, clinical laboratory services, surgical and prosthetic appliances, ambulance services, prescribed drugs provided by pharmacists, hospitalization, clinic care, convalescent and nursing home care, and home nursing services.

Under the "minimum" heading, they said, Rhode Island insists on public assistance that supplements personal and community resources, but does not supplant them. They also pointed out that the program does not provide luxury-type medical services to the patient and that special approval is required for extraordinary or expensive services and supplies.

For example, they stated, dentures cannot be authorized without consideration of the age of the patient, length of time the patient has been without dentures, condition of present dentures, and patient's attitude.

During one 30-week period, Pesare and Tierney reported, the total amount requested for dental care for adults in the Federally aided program was \$69,172. After review by the department's dental consultants, about 52 percent was approved, 33 percent denied, and 15 percent left pending for future consideration.

Practitioner's fees paid by the State are lower than those expected of average income people who are paying for their own services, they said. The physician receives a maximum of \$7 for a home visit and \$9 for a boarding, nursing, or convalescent home visit regardless of the number of patients seen. The maximum all-inclusive rate for hospitalization is \$14 a day.

## Moderate Control

Moderate administrative controls are used, they reported. Bills are accepted without prior authorization for physicians' visits up to 8 a month for an acute illness and 2 a month for a chronic illness. However, they said, all dental services, except for the immediate relief of pain, require written authorization.

Pesare and Tierney reported that the same medical care standards prevail throughout Rhode Island—for



the locally administered general public assistance cases as well as the Federally aided categories of assistance administered by the State.

Payment within 30 days for services and supplies, they believe, has contributed to the success of the program.

provisions give added impetus to community health planning and health promotion and chronic disease control, he added.

Experience has indicated that no blueprint can be imposed upon any community, Cronin stated. Community rehabilitation projects, he said, might grow out of, or be centered in, a hospital rehabilitation program. They might be part of a broad chronic disease control plan. They might be sponsored by social agencies, workmen's compensation agencies, or a combination of agencies interested in problems of the disabled. Under the new amendments, two or more States may pool Federal grants for construction of a facility.

## Rehabilitation Programs . . .

*Amending legislation passed in 1954 has widened the scope of the Hill-Burton program to include nursing homes and rehabilitation facilities and has provided for the rapid expansion of the public vocational rehabilitation program.*

### Hill-Burton Amendments Include More Facilities

Nursing homes, chronic disease facilities, rehabilitation facilities, and diagnostic or diagnostic and treatment centers are now included in the Hospital Survey and Construction Program. Popularly called the Hill-Burton program, over the past 8 years it has approved projects providing more than 160,000 hospital beds and 483 health centers. The Public Health Service joins individual State agencies in administering the program.

According to John W. Cronin, M.D., chief of the Division of Hospital Facilities, Public Health Service, the expanded program offers a wide range of services for the chronically ill and the physically and mentally impaired. For rehabilitation facilities, emphasis will be on integrated medical, psychological, social, and vocational evaluation and services under competent professional supervision.

Legislation enacted in 1954 (Public Law 482, 83d Cong., 2d sess.) provides for fact-finding surveys to define needs of communities for rehabilitation facilities, as a prerequisite to developing State plans to meet these needs, Cronin said. Sur-

vey and planning grants are available to States on a dollar-for-dollar matching basis until expended.

In addition, grants to construct and equip rehabilitation facilities are authorized for the statutory life of the existing program—through fiscal 1957. The rehabilitation facility need not be part of a hospital, a revision contained in the new legislation. Funds allotted for rehabilitation purposes may not be transferred to funds allotted for other categories, but this provision does not apply to funds for chronic disease hospitals, nursing homes, and diagnostic or diagnostic and treatment centers. The new amendments also provide for maximum and minimum allotments.

#### Community Initiative

Essentially, the broadened program will operate like the original one, Cronin explained. Initiative for building facilities and their operation rests with each community. Each project is approved according to a State plan. Federal contributions range from 33½ to 66½ percent of the total project cost, as determined by the respective States.

Cronin noted that the act's integration features have important implications for interprofessional collaboration and performance. Its

### Rehabilitation Program Hinges on Manpower

The success of the recently expanded Federal program for rehabilitation will depend upon the total available supply of qualified personnel, declared Catherine A. Worthingham, Ph.D., D.Sc., director of professional education, National Foundation for Infantile Paralysis, Inc., New York City.

Defining rehabilitation as total patient care rather than a specific group of techniques, Worthingham emphasized that a team of persons, including the patient, is needed if complete rehabilitation is to be achieved.

In addition to the physician and other professionally trained persons—nurse, physical therapist, occupational therapist, medical social worker, clinical psychologist, and vocational counselor—the family, the teacher, the religious leader, and the employer may be needed to complete the rehabilitation team, Worthingham stated.

The specialties and the type of rehabilitation facilities will vary in each case, depending on the patient and on the situation. Treatment

# VOCATIONAL REHABILITATION

may be possible at home, or the services of a hospital or any of a large number of community services may be required.

In metropolitan areas and in medical teaching centers, rehabilitation centers, providing equipment and services at a centralized location, will be needed, Worthingham said, but in small communities, provision of complete facilities and personnel for small groups of patients is too

ber of students entering training and the capacity of schools to receive them, at the same time sparing no effort to protect the standards of education and practice, she said.

Personnel shortages in each field should be studied. Determination is also needed as to what these services are and what types of nonprofessional personnel can perform them. A balanced distribution of existing personnel in teaching, in

of the Office of Vocational Rehabilitation, outlined the main provisions of this new legislation which became Public Law 565 (83d Cong., 2d sess.) in August 1954.

As a result of its passage and supplemental appropriation legislation, States have increased latitude and increased Federal support with which to operate their rehabilitation programs, Gerber indicated. The new legislation provides for:

Research into the techniques and practice of social restoration of the disabled.

More facilities for the assembly of the necessary rehabilitation services.

Training of essential professional personnel.

Creation of a national advisory council on vocational rehabilitation.

The entire range of rehabilitation services provided under the program since 1943 is continued.

*Since 1920*

The public vocational rehabilitation program has been a Federal-State partnership from its inception in 1920, with the States operating their own service programs, Gerber said. In 1943, physical restoration services were added to the original program of job training, guidance, placement, and the purchase of prosthetic appliances, thus making it possible for the States to correct or minimize the disabling condition. With annual increases in appropri-

## Existing personnel and increases needed for rehabilitation services in 5 fields

Type of personnel	Number available	Immediate increases needed	
		Number	Percent
Nurses-----	350,000	50,000	14
Physical therapists-----	6,000	2,500	41
Occupational therapists-----	4,000	2,900	72
Medical social workers-----	3,300	1,000	30
Vocational rehabilitation counselors---	1,200	500	41

expensive. Such areas must depend upon cooperation and communication between various types of rehabilitation facilities.

### *Use of Professional Personnel*

According to Worthingham, immediate increases in personnel are needed in all fields essential to rehabilitation. The accompanying table shows these needs in five important fields.

Present estimates of personnel needs do not include statistics on employment or job vacancies except for hospital programs, Worthingham stated, and it cannot be determined how many employees are devoting their entire time to services for which they were trained. Nonprofessional personnel frequently can perform services for patients that will free professional personnel for the services that require professional training.

The maximum use of existing personnel is at best a stopgap, she believes. Concentrated effort must be made, therefore, to increase the num-

programs emphasizing prevention of disability, and in programs for care of the severely handicapped is also important, she said.

In closing, she stated that "orientation courses for existing personnel should result in better utilization of available manpower," and that "scholarships for students and financial assistance to professional schools is the only way to increase the manpower for rehabilitation services without sacrificing the quality of those services."

## Vocational Rehabilitation Expanded by New Law

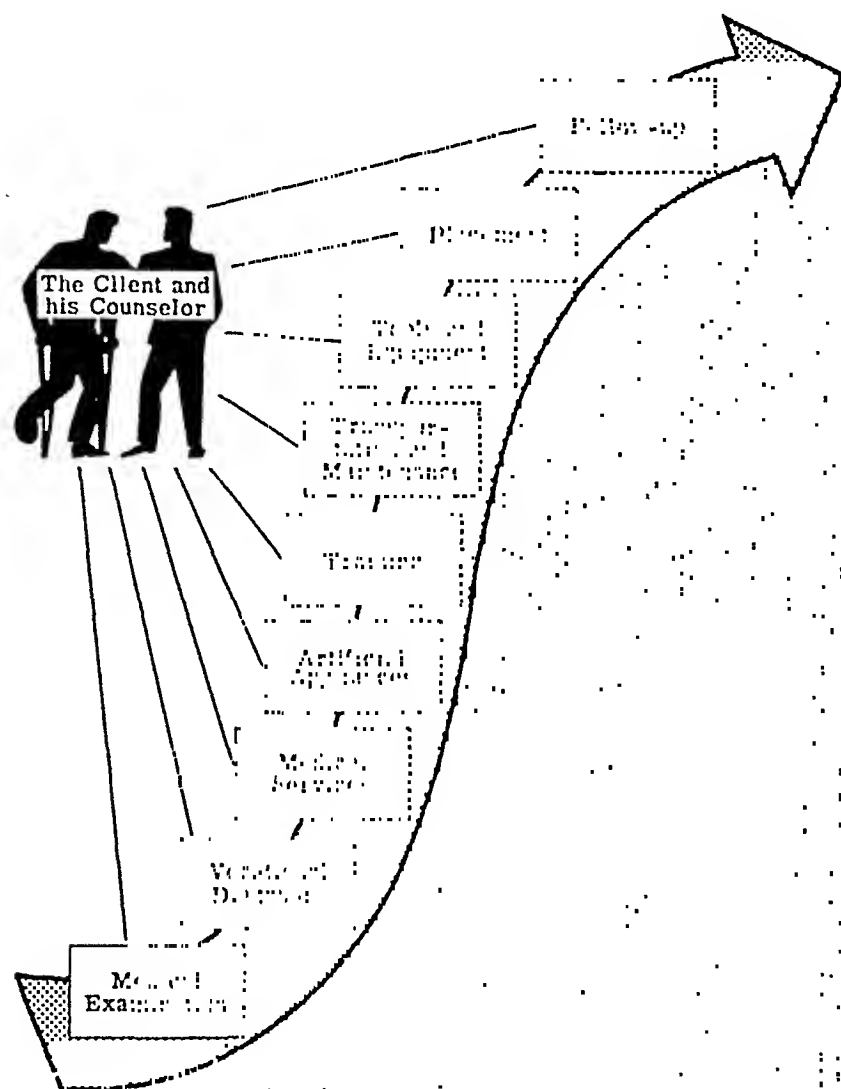
By the unanimous passage of amending legislation, the Congress has provided for the rapid expansion of the public vocational rehabilitation program.

Terming the program an investment in human welfare that is self-liquidating, Joseph Hanford Gerber, M.D., Dr.P.H., chief medical officer

## Number of persons served and number rehabilitated, 1944-53

Fiscal year	Persons served	Persons rehabilitated
1944-----	145,059	43,997
1945-----	161,050	41,925
1946-----	169,796	36,106
1947-----	170,143	43,880
1948-----	191,063	53,131
1949-----	216,997	58,020
1950-----	225,724	59,597
1951-----	231,544	66,193
1952-----	228,481	63,632
1953-----	221,847	61,308

**The rehabilitation process. Counseling and guidance is the core of all services.**



tions, the number of disabled persons returned to gainful employment has rapidly increased.

No disabled person is considered to be rehabilitated until he has been placed in suitable employment, after being provided with substantial rehabilitation services, he continued. For services other than diagnosis, counseling, training, placement, and followup, the individual is expected to contribute to the cost according to his ability.

Gerber said the increased support to the States is provided by the new

legislation in three types of Federal grants-in-aid:

The basic support grant—allotted to the States on the basis of population weighted by per capita income.

The extension and improvement grant—allotted to the States on the basis of population. These funds are to be used for projects which will provide better vocational rehabilitation services. The Federal share may be 75 percent of the total cost of a project for a maximum period of 3 years.

The special project grant—made

to States and public and other non-profit agencies for the purpose of paying part of the cost of research projects, demonstrations, training and traineeships; and for projects to establish special facilities and services which hold promise of making a substantial contribution to the solution of vocational rehabilitation problems common to all or several States. In 1955 every \$2 of Federal money must be matched by \$1 furnished by the project sponsor.

### Higher OASI Benefits Reduce Public Aid

The reduction in public assistance caseloads and costs resulting from the 1954 Social Security amendments were emphasized by I. Jay Brightman, M.D., M.S.P.H., in his discussion of the increase in Old-Age and Survivors Insurance benefits and the extension of the program to large new groups.

Dr. Brightman, assistant commissioner for welfare medical services, New York State Department of Health, noted that in February 1951 more than 460,000 aged persons were receiving both old-age assistance payments and OASI benefits. Many insurance beneficiaries, he pointed out, have required supplementary assistance if they receive minimum insurance benefits and have few other resources.

The increase in insurance payments has already permitted supplementary assistance to be discontinued for many beneficiaries, and a further decrease is expected, he said. Brightman also reported a decrease in caseloads and costs in the aid to dependent children category of public assistance.

Brightman believes that the higher degree of financial security offered by the insurance benefits based on the worker's own contributions, augmented by interest and dividends from previous savings and securities, and the current earnings allowed up

to \$1,200 a year, will have a significant effect on public health. Financial security should provide for a better emotional adjustment and decreased stress in the later years, and thus should become a potential force in reducing the prevalence of psychosomatic aspects of chronic illness, he explained.

For the less advanced forms of both mental and physical illness, financial security may permit an aged person to provide the necessary

services for himself and increase his chances of remaining in his own home or the home of friends and relatives rather than being institutionalized, he said.

The OASI amendment preserving the insurance rights of persons who become totally disabled before they have established permanent eligibility, Brightman believes, will stimulate interest in the rehabilitation of the disabled insurance beneficiaries whenever possible.

Housing code enforcement resulted in significant improvement of the housing quality by making the dwellings healthier and safer places to live. The improved maintenance should also prolong the usefulness of these houses.

## The Study Procedures

The housing quality of the pilot study area was measured by the American Public Health Association's Appraisal Method for Measuring the Quality of Housing, which uses a penalty scoring method.

The "before" survey was made in May 1951, and the "after" survey in October 1952. In 1951 the survey area contained 1,042 dwelling units in 25 adjacent blocks, and the score was completed on 989 units. In 1952 the area contained 1,017 units and 976 were scored. About 90 percent of the units not scored were vacant, Johnson and his colleagues reported.

The 1952 survey was made after 18 months of enforcement effort. About 56 percent of the enforcement cases were already closed and most of the remainder were completed. Work in progress during the 1952 survey was given full credit in scoring, they said.

## Results

The Baltimore Housing Code and related regulations did not, during the survey period, establish the same standards or even cover the same items used in the appraisal method, which, for the most part, is based on higher standards.

The study group reported the following results:

The average total dwelling score improved about 36 percent; facilities improved about 13 percent; maintenance, about 74 percent; and the occupancy improvement was not statistically significant.

The average gross rent increase amounted to \$5.70 from \$48.20 to \$53.90 per month. During the same time the median income of the families in the study area increased from \$239 to \$259 per month. Owner occupancy remained at 41 percent.

# On Healthful Housing . . .

*Housing code enforcement succeeded in remedying at reasonable cost substandard dwellings in a Baltimore area, a pilot study in housing rehabilitation finds. Prevention of blighted areas is also advocated in papers on planned inspections, communitywide planning of workers' new homes, and a PHS training course in housing hygiene.*

## Baltimore Housing Study Weighs Effects of Code

While modest rent increases may be expected from enforcement of a housing code in a housing rehabilitation program, the increases are not so large as to force low-income families to move, according to the results of the first detailed study of housing quality "before" and "after" rehabilitation.

The study, made in Baltimore, was reported by Ralph J. Johnson, M.S., chief, and Roy O. McCaldin, M.S., assistant chief, Housing Hygiene Activities, Division of Sanitary Engineering Services, Public Health Service, and Huntington Williams, M.D., D.P.H., commissioner of health, Baltimore City Health Department.

The scale of the study was not large, and the conclusions cannot be assumed to be representative of

housing rehabilitation in other cities or even in other parts of Baltimore, they warned, but if the basic information is carefully considered, it may provide an indication of what may be expected in other communities.

The Public Health Service provided general direction for the study, supervision of the field work, and prepared the analysis of the data; the Baltimore City Health Department provided the enumerators and related data and assistance, they reported.

Other conclusions cited from the study data were:

Compliance with minimum health and safety standards for substandard housing is possible without a directly proportionate rent increase since rent and housing quality were not found to have a reasonable relationship to each other either before or after rehabilitation.

education programs, sponsored by the National League for Nursing and the Public Health Service.

### *More Data Needed*

To determine the cost of collegiate nursing education, the speakers said that more data are needed on:

The portion of general expenditures and the portion of expenditures for instructions that can be charged to nursing education.

The monetary value of all contributions from agencies participating in college nursing education.

The cost of the contribution of the school of nursing faculty to other hospital functions and to community service.

The cost of nursing education per student.

The part of this cost covered by tuition, student service, and other income.

When these questions are answered, the extent to which the data can help in estimating the cost of establishing new collegiate programs may be determined.

Few schools are able to answer these questions, the authors continued. "In view of the mounting concern over these special problems," they said, it was decided to study possible methods for determining the cost of basic collegiate nursing education in the university, including the hospital, the public health agency, and other participating groups.

In addition, they said, a manual is to be prepared describing a practical method of analysis by which the schools of nursing and their associated agencies could obtain first-hand knowledge of direct and indirect costs.

Twenty-eight general and special hospitals, 17 public health agencies, and 6 colleges and universities—the Loretto Heights College and the University of Colorado, Denver; Emory University, Atlanta; Skidmore College, Saratoga Springs, N. Y.; Syracuse University, Syracuse, N. Y.; and the University of Washington, Seattle—are partici-

pating in the project by testing tentative cost analysis methods developed for the study. Knott and Vreeland stated. They reported that the deans of these schools and their associates would hold a conference in December 1951 to discuss the soundness of the methods used in the schools, and that a manual based on their experiences is to be published in 1955 for use in a large number of colleges.

Because of their participation in collegiate training programs, public health nurses are deeply interested, particularly in the relation of this cost to public health nursing, Knott and Vreeland said. In conclusion, they stated that, although the answer to the question of determining the cost of collegiate nursing education is yet to be found, it is believed "that a reasonably sound method is emerging and the indications are that it will achieve its purpose."

### **Education on Medical Care Needs Investigating Spirit**

For a disease as thoroughly worked over as tuberculosis, not even rudimentary knowledge exists of what might be called its "economy," despite the quantities of information available on costs.

In discussing professional education and medical care, the president of Johns Hopkins University, Lowell J. Reed, Ph.D., said the same gap applies still more strongly to knowledge of illness in general.

Professional schools—those of medicine, dentistry, and nursing—need to extend the student's knowledge concerning the subject of medical care so that he can approach the problem from the population point of view, with the involved interactions which this means, he observed.

"We need to know how a given illness, or illness in general, affects the society, and conversely the ways in which social organization and behavior affect illness," he said.

Reed used the phrase "medical

care" as meaning "an organized program having as its objective the prevention, diagnosis, and treatment of illness in the population, rather than in the individual."

He described the linking of medical care, in this context, with education as, first, acquainting professional students with organized health programs within health departments, labor unions, group clinics, and the like, and then preparing them for future participation, with their specific skills.

The professional school's concern, he said, should be with those factors and elements of medical care that have some bearing on all the professions, not on those specific to a particular profession.

### *What to Teach*

That the need to know how illness in general, or a given illness, affects the society, and the reverse, was pointed up by the President's Commission on Health Needs of the Nation, according to Reed, also a member.

He commented that the fourth volume of the commission's report is the best existing compendium of information on this subject, but that it still lacks synthesis. Spotting these gaps in knowledge would be a challenging intellectual exercise, he observed.

What can universities teach when they are faced with a lack of an organized body of knowledge about medical care, Reed questioned.

Any of the subject matter now being presented in seminars, lectures, or field experiences pertinent to this field can be taught, he stated, pointing out that school administrators should be chary about teaching which might tend to solidify methods of medical service based on too little experimentation.

"All that I ask is that it be approached in the spirit of investigation on the part of both student and teacher," he said. The teacher, in presenting any specific idea, observation, or experience, should at-

tempt to answer the question as to where the experience fitted into the organized pattern of such knowledge, he suggested. Reed noted that almost without exception the highly successful programs touching on the field of medical care are associated with inspired teachers—those capable of lifting this material from its unorganized state and dramatizing it.

## Urges Tests That Reflect Students' Real Progress

We must use tests which require our medical students to think and reason if that is our objective, said John T. Cowles, Ph.D., professor of psychology and assistant for personnel services, School of Health Professions, University of Pittsburgh.

Urging professors of preventive medicine to concentrate on the defining of educational objectives so that more adequate evaluative tests can be devised, he also said:

"To make real progress in medical education, whether through the day-to-day trial of a new teaching method by a single professor, or through much more elaborate experiments in curriculum revision involving inter-departmental coordination, we can never know that our steps are forward rather than backward except through carefully planned use of sound evaluative techniques."

### *Need Improved Techniques*

In Cowles' opinion, the burden of evaluating a student's progress or final proficiency in the practice of preventive medicine falls upon the individual school, department, or professor, who can best solve the problem of adequate measurement by going beyond testing accumulated knowledge to using valid tests of complex skills and the nebulous factors that make up a personality.

Using clever questions, the newer objective tests now test the critical interpretation of experiments, the

solving of practical problems, the use of relevant versus irrelevant data, the adducing of hypotheses and their testing, and even the subtler points of diagnosis, treatment, and prognosis from unfamiliar case histories, he continued.

Cowles recommended that existing selection or achievement tests, such as the medical college admission test, the tests of the National Board of Medical Examiners, or other tests of reasonable promise, be given a thorough trial. Where written objective tests cannot serve, real effort should be expended to devise new kinds of evaluation measures, he said.

Teachers of medicine should participate closely in the construction of their own everyday evaluation instruments and make bold attempts to use the newer objective techniques, he believes. These, he said, should be as objective as possible, as statistically and educationally sound as can be assured by available criteria, and also practical and meaningful from the school's standpoint as well.

The great need for improved testing techniques, Cowles noted, was voiced by the 1952 Colorado Springs Conference on Preventive Medicine in Medical Schools and the 1953 teaching institute of the Association of American Medical Colleges.

## Field Training Essential For Public Health Dentist

To provide public health dentists with a working knowledge and practical experience in dental public health administration, field training must become an integral part of graduate education, declared Philip E. Blackerby, Jr., D.D.S., M.S.P.H., director, division of dentistry, W. K. Kellogg Foundation, Battle Creek, Mich.

Opportunities for field training are not now available, he said, but organized attempts to make a systematic study of the problem and

to formulate plans for its solution are under way.

The fundamental objectives of field training are to provide students with a working knowledge and practical experience in general and dental public health administration, Blackerby stated.

An educational agency should have the primary responsibility for the planning and general supervision of a field training program, he said, and this institution should work closely with the service agency which functions as a training center. The responsibilities which each agency is to assume should be clearly defined, he said.

### *Training Facilities*

Suitable facilities will be needed to carry out both the individual and the joint responsibilities of the school of public health and the field training center, Blackerby said. He suggested that the facilities of the field training programs operated by most of the States for other public health personnel be used for training public health dentists.

The centers selected should be desirably located geographically; supervised by a preceptor, preferably affiliated with the school of public health, who has the experience, interest, and capacity to train personnel; and have a suitable training program and a staff willing to evaluate and report on the progress of the trainees.

Problems to be solved will include financing the training center and at least partially subsidizing costs to the trainees, Blackerby stated. He suggested that State health departments be encouraged to develop field training centers for dental personnel and to give greater attention to dental public health in the field training experiences offered to other types of public health personnel.

He also suggested that schools of public health take a more active and direct interest in the organization and conduct of field training programs, both intra-academic and post-academic, for public health dentists

and for other categories of public health personnel, and that one or more pilot programs be established in selected States.

## Dental School in London Rearranges Curriculum

Recent rearrangement of the 5-year course offered by the London Hospital Dental School represents a true experiment in undergraduate education, declared A. M. Horsnell, F.D.S., director of conservative dentistry at the school and dental subdean, London Hospital Medical College.

The children's dressership follows, for all practical purposes, immediately after the year of basic sciences, although it is actually preceded by an introductory course, in which periodontology, clinical examination routine with children as patients, instruction in local anesthetics, and a modified phantom-head course are given concurrently, Horsnell stated. Thus, students will continue directly from their study of physiology, anatomy, and embryology to the clinical observations of growth and development.

Under the plan, the students will be introduced in a logical way to dental pathology as it progresses in the month, he explained. Some 18 months to 2 years after they have completed their study of the basic sciences, when they know about preventive dentistry, periodontology, and restorative procedures, they will be taught dental prosthetics. They will then have a year or more in which to practice all aspects of dentistry concurrently. Dental mechanics, he said, will be taught as an adjunct to clinical prosthetics.

According to Horsnell's review of developments leading up to this arrangement, one important feature is the placement of the children's dressership early in the curriculum. Study of the traditional program, in which this dressership came late, indicated that the students were merely fulfilling the minimum re-

quirements and that only in isolated instances did they or their young patients gain any real benefit from the dressership. "We began to wonder whether this placement of the dressership was giving the impression that there must be something difficult about the treatment of children," he said.

Horsnell reported that some 2 or 3 years ago pedodontics was made the first dressership, with the following results: These trainees have shown by far the greatest aptitude for children's dentistry; the patients have received their dressers with greater enthusiasm; more complete treatments and followups have been accomplished; and, incidentally, these trainees have turned out a much higher quality of general restorative dentistry.

## Postgraduate Education

Another postwar development of particular significance is the increase in postgraduate study, Horsnell maintained. In this connection he mentioned the establishment of the Institute of Dental Surgery, which is closely associated with the London University, the Royal College of Surgeons, and the Postgraduate Medical Federation, and he noted that the Royal Colleges have established their own dental faculties and examinations for the fellowship in dental surgery.

The National Health Act of 1918, he reported, made provision for persons engaged in its service to attend postgraduate refresher courses, such courses to be given by the universities in conjunction with the Ministry of Health. These courses have the support of the British Dental Association and are getting under way, he said.

## Awareness of Dental Health

As a factor related to dental education in Great Britain, Horsnell emphasized the increased awareness of dental health on the part of the population, with a concomitant increase in the demand for treatment.

"Under these circumstances, the number of applicants now seeking entry into our schools cannot be considered satisfactory," he stated.

Horsnell also emphasized the intimate relation between recruitment and dental education in its broadest sense. "A fuller appreciation by the public of the benefits of dental health and the cost of dental disease automatically produce a greater demand for trained personnel," he said. "Greater dental consciousness would raise the status of the profession, and if the status is raised, there is little doubt that the number of recruits would similarly be raised."

He pointed to "good treatment to the proper section of the population" as the surest way to educate the public in dental matters, and he indicated that children represent the proper section of the population.

## Stresses Field Experience For Training Teachers

How professional laboratory experiences are being used to equip prospective teachers in health education was the topic of a report from Edward B. Johns, Ed.D., associate professor of health education, University of California, Los Angeles.

The concept of laboratory experiences in education, Johns explained, is best clarified in the definition prepared by the American Association of Teachers Colleges:

"Professional laboratory experiences include all those contacts with children, youth, and adults (through observation, participation, and teaching) which make a direct contribution to an understanding of individuals and their guidance in the teaching-learning process."

Johns noted that one result of these experiences is greater participation in community activities on the part of teachers. He remarked that between 40 and 45 teacher education institutions today offer cur-

riculums to prepare school health education personnel, a significant trend which is highly endorsed.

From a 1953 survey of 34 institutions having such curriculums, Johns selected these indicators of the need for more purposeful laboratory experiences (they are based on data classified under three categories—laboratory experiences prior to student-teaching, experiences during student-teaching, and community field experiences):

The lack of understanding of the school health program on the part of administrators is a major problem.

The procedures utilized before and during student-teaching are in accordance with accepted educational standards.

More than half of the institutions surveyed have a course on field experiences in health education or they include, in other courses, actual work experience in the community. The other institutions are depending on observation of community health agencies as their chief type of field experience.

There is need for the inclusion of additional laboratory experiences and for improvement in the quality of present experiences in the three categories, but particularly in the area of community field experiences.

A large majority of the institutions stated that they plan to increase their offerings in field experiences in the near future.

## Washington Health Officers Find Institute Stimulating

Institutes are an effective method of imparting to public health officers knowledge concerning interpersonal relationships and the influence of emotional factors in disease processes, according to Herbert S. Ripley, M.D., and Leland E. Powers, M.D., M.P.H. In addition, staff relationships may be improved by the change in views and attitudes, they said.

Dr. Ripley is professor and executive officer, department of psychiatry, University of Washington School of Medicine, Seattle, and Dr. Powers, formerly professor and executive officer in the university's department of health and preventive medicine, is with the department of preventive medicine and public health, American University of Beirut, Beirut, Lebanon.

Interest in mental health as a part of public health and preventive medicine has increased during the last few years, they said, and teaching institutes have been held from time to time since 1948.

### Organization

The mental health institute held at the University of Washington in Seattle in 1950 was attended by 39 public health officers, they reported. The students were organized into small discussion groups, each led by a public health administrator and a psychiatrist.

Orientation discussions by the teaching staff were followed by attendance at medical wards of the county hospital, wards at the tuberculosis sanatorium, clinics, and informal seminars. In the evening there were informal discussions and debate on subjects such as the relationship of the health department to the general public and to the schools, the churches, private and governmental agencies, and physicians.

Replies to questionnaires sent to all participants a year after the institute was held indicated that the students were satisfied with the general methods used in conducting the institute and that the attitudes and knowledge gained had been widely applied in their daily work, the speakers reported.

Informal personal visits to 13 health departments suggested that "changes that cannot be accurately measured had occurred with a trend toward more skill and understanding in dealing with individuals and groups, better staff morale in the health department, improved atmos-

phere in clinics, closer relationship with the community as a whole, and better appreciation and utilization of available facilities."

The questionnaire revealed that the participants overwhelmingly favored the centering of institute discussions around patients, allocating more time for informal discussion than to clinics, and a maximum 1 hour a day formal lecture session. The participants also felt that 7 to 10 days should be set aside for an institute, and that the participants should decide how much time should be spent in clinics and for discussion of a particular problem.

Ripley and Powers said that the State and Provincial health directors who had observed the participants for 2 years reported that at least two-thirds of them had benefited from the experience. They also reported that at a 3-day refresher meeting held in 1953, two-thirds of those attending had been students at the original institute in 1950. The participants in the refresher institute showed a vital and active interest throughout the meeting, and there was a unanimous expression that the institute had been stimulating, interesting, and helpful in carrying forward professional responsibilities.

## Cincinnati Health Teachers Get Inservice Education

Health teachers participate in all phases of Cincinnati's inservice teacher education program, which ranges from extracurricular committee work to professional and cultural study with academic credits, said William K. Streit, Ed.D., director of health and hygiene in the city's public school system.

Cincinnati's program is unusual in that there is no released time for committee work, Streit said. The program places major emphasis on committee work to which members of the school staff contribute their



ideas. These activities include curriculum revision, teacher self-appraisal, appraisal of textbooks, teaching materials, and visual aids as well as many opportunities for child study and self-development through workshops, institutes, preparation of publications and scripts, and specially planned meetings.

Teacher committees have helped develop Cincinnati's health courses at various school levels, he said. In this, they have outside cooperation from the health department, the Academy of Medicine, the Public Health Federation, representative parents, and various health and welfare organizations.

Textbook committees, working at four grade levels in health, evaluate textbooks for curricular criteria, authorship, organization of content, motivation, style, vocabulary, illustrations, and format, he said. Publishers, as well as the city's board of education, are guided by these recommendations, he said.

Three subcommittees appraise supplementary teaching materials in the field of health, Streit said. As a combined committee, in 1953-54 they previewed 421 health and safety films and graded and grouped the films according to units of study. This group also works with the Visual Aids Exchange and the Museum of Natural History in Cincinnati in appraising models and charts for health teaching.

Health teachers took a 40-hour course in driver education in 1953-54 because this phase of safety has been incorporated into the 10th grade health program, he said. Also, at the annual 4-day teachers institute, 4 sections of interest to health and safety teachers were scheduled.

## Mental Health Stressed In Teacher Training

The emphasis in on-the-job training programs has shifted in recent years from subject matter and teach-

ing techniques to the teacher's relations with pupils, parents, and the community, according to Jennelle Moorhead, M.S., associate professor in the general extension division of the Oregon State system of higher education.

In that shift, the mental health aspect of those relationships is of increasing concern to school authorities, she said in summarizing the report of the American School Health Association's Committee on Mental Health in the Classroom.

The report discussed some of the principles to be followed in setting up mental health training programs, indicated frequently encountered problems, and reviewed a number of programs employing different and difficult approaches. The report pointed out the following:

The purpose of inservice training in mental health is to help the teacher attain greater self-knowledge and more insight into the meaning of children's behavior. The beginning teacher may be bewildered to find that, despite excellent preservice training, he was prepared for ideal situations rather than overcrowded classrooms. It is precisely in the area of establishing satisfactory home, school, and public relations that preservice training is weakest. These combined problems may affect the beginning teacher's mental health.

The experienced teacher may be unaware of how much has recently been learned in the field of child behavior, growth, and development, and there is much he could learn in an inservice training program.

## Teacher Objections

However, teacher opposition may be encountered in setting up inservice training programs in mental health. Many teachers resent giving up their time. Others regard the programs as an implied criticism of professional ability. Some may resent any disturbance of their teaching patterns, while others have never worked successfully in groups and fear any group experience. All these

attitudes are mental health problems. These teachers need help in improving their own human relationships before they can understand and help the children in their classrooms.

The objectives of training programs in mental health can best be achieved by arousing the teachers' enthusiasm which depends largely on the part the teacher has in planning the programs. The training should grow out of the felt needs of teachers, and the entire school staff should participate. Parent participation, to bridge the gap between home and school, is encouraged.

## Superior Program

Enrollment figures for education classes in mental health at the University of Michigan and Wayne University indicate the success of the Detroit school system in arousing teacher interest.

When the Detroit program was started in 1947, the two universities jointly offered a 16-week course which included half hour showings of films and transcripts, an hour's lecture by a psychiatrist, professional educator, or social worker, and an hour of discussion. By July 1952, the course had been given 15 times with an enrollment of 2,856. Advanced courses attracted an enrollment of 558. A total of 3,680 school staff members attended short courses of three meetings each.

The Detroit program featured the visits of a psychiatrist to classrooms one afternoon each week to discuss his observations with the teachers. Similar programs are being carried out in Los Angeles and Madison County, Ill., and by State education departments in Massachusetts, Oregon, and Pennsylvania.

School systems throughout the country are coming to realize that teachers should have the same skill in recognizing mental illness among children as they now show in detecting physical handicaps.

# Epidemiological Studies . . .

*What clues have been uncovered as to the causes of the recent outbreaks of infantile diarrhea? Investigators report their findings as well as observations on shigellosis, infectious hepatitis, and toxoplasmosis. In another report, healthy bats are suspected as rabies carriers.*

## Links Ohio Outbreak To Environment

A contaminated environment may have a major part in the spread of infantile diarrhea in a hospital nursery.

This was the conclusion reached during a 2-month outbreak of contagious diarrhea among young babies in Children's Hospital, Columbus, Ohio, late in 1953. As a result of this experience, measures to prevent the spread of this infection in the hospital have been modified and improved.

So stated Warren E. Wheeler, M.D., professor of pediatrics, Ohio State University, Frederick Wentworth, M.D., communicable disease division, Ohio Department of Health, Bertha Wainerman, M.D., and R. T. Ravenholt, M.D., of Columbus.

They reported that the source of the outbreak could not be determined, but that the increase in infantile diarrhea cases admitted to the hospital in the fall of 1953 apparently reflected the prevalence of infections with *Escherichia coli* O111 in the community.

Twenty-seven infants in two nurseries and nine adult contacts among the hospital personnel were involved in the outbreak. Five of the babies acquired their infection at home. Three of the hospital personnel were porters who cleaned the rooms but had no direct physical contact with the babies.

One nursery contained a diarrhea unit and a respiratory unit. The same treatment and utility rooms

were used for both units, and the same resident physicians and nurses cared for the patients. The other nursery was used chiefly for surgical cases and had its own physicians and staff nurses, who cared only for the patients in this nursery. The nursing supervisor and some of the housekeeping personnel, however, served both nurseries.

## Treatment and Prophylaxis

Specific treatment with chloramphenicol, neomycin, or oxytetracycline was given, along with symptomatic treatment and water and electrolytic replacement therapy. Penicillin, sulfadiazine, or both, were given to most babies in an effort to prevent respiratory infections.

Prophylactic administration of chloramphenicol failed to prevent cross-infection—half of the babies developed resistance to the drug—but positive cultures declined sharply after beginning neomycin therapy. All babies who received chloramphenicol or neomycin also were given vitamin K.

Evaluation of environmental contamination was attempted during the latter part of the outbreak. However, at that time, the outbreak was almost under control, and, perhaps because of therapy, only a few organisms were found.

Wheeler and his co-workers pointed out that a nursery in a general children's hospital cannot be closed when a diarrhea epidemic occurs. If the disease is present in the community, the hospital must be prepared to receive infants who have the disease.

They recommended that at the beginning of an epidemic in a hospital ward, no babies under 6 months old be admitted until it is reasonably certain that the epidemic is under control. Babies under 2 months old are very susceptible to infection with *E. coli* O111, and the cross-infection rate is much higher in this age group than among older infants.

Wheeler and his colleagues also recommended that chloramphenicol not be used as a preventive agent because of the resistance to this drug developed by this strain of *E. coli*.

One of the measures taken by the hospital was to see that personnel acquiring the infection were treated with neomycin and excluded from work until a negative culture was obtained.

## Shigellosis Agent Shift Found in Two Epidemics

A dysentery epidemic may be viewed as a dynamic process in which different serologic types exhibit varying degrees of success in invading the host population. Lt. Col. Robert B. Lindberg, MSC, USA, and Kenzo Okabe, Ph.D., concluded after observing shigellosis outbreaks among prisoners of war in Korea and Japanese civilians in Tokyo from 1950 to 1953.

Colonel Lindberg is in the Department of Bacteriology, Army Medical Service Graduate School, Walter Reed Army Medical Center. Dr. Okabe is in the Department of Chemistry, Japan Armed Forces Medical Laboratory, Kurilama, Japan.

Shigellosis, they said, is a disease of classic importance in military medicine and among civilians displaced by war or natural disaster. But recently developed techniques for distinguishing *Shigella* strains by antigenic analysis, they continued, have not been widely used to study causative types in epidemics.

In both the Tokyo and Korean outbreaks of bacillary dysentery, the

predominant etiological agent, according to Lindberg and Okabe, was a *Shigella flexneri* type or group of types which was replaced by another *flexneri* strain during the 3-year period.

The situation in metropolitan Tokyo, where reported cases of bacillary dysentery rose from about 58,000 to over 100,000 per year between 1951 and 1953, was the simpler of the two, they said. One preponderant type, *Shigella flexneri* 2a, was slowly but consistently replaced by the closely related but biologically distinct type 2b. *Shigella sonnei* and several less frequently occurring *flexneri* types were constantly present but did not fluctuate markedly in incidence.

### Situation Contrast

The epidemic in Korean prisoner of war camps was much more severe than the outbreak in metropolitan Tokyo, Lindberg and Okabe reported, and since the camps had a confined, although shifting, population living under less than optimal conditions of sanitation, the circumstances were quite different. The carrier and contact rates, they continued, were undoubtedly greater in Korea. However, they found a comparable fluctuation pattern in type incidence.

Two types, *Shigella flexneri* 4 and 3, dominated the Korean epidemic at its start. But they diminished in consequence while types 2a and 5 rose steadily to comprise the major causative agents at the end of the outbreak.

### Speculations

There is no established reason, said Lindberg and Okabe, for the type shifts reported in these epidemics. Since it has been suggested that people might develop immunity through contact with the original causative agents, Lindberg and Okabe agreed that this factor might be significant for epidemics among a closed population. But they doubted that an immune group could be altered as rapidly as ob-

served outbreak conditions in Japan would demand.

Another speculation, they said, concerns the role of bacteriophage in the destruction of predominant types. In this connection, it has been surmised that the alterations might represent abrupt genetic changes among the *Shigella* organisms. Lindberg and Okabe said they found no grounds for assuming the operation of such a mechanism in these epidemics.

They pointed out the necessity for continued observation of dysentery epidemics if the significant types are to be recognized. This recognition, they continued, is the essential basis for control of carriers.

### Reviews Toxoplasmosis, Urges More Study

The incidence of toxoplasmosis in different locales varies sufficiently to require examination of multiple serum samples from a patient suspected of having acquired the disease, noted Harry A. Feldman, M.D., in discussing various laboratory and epidemiological aspects.

Dr. Feldman is associate professor of medicine, State University of New York, Upstate Medical Center, Syracuse.

Many times a clinical syndrome has been related to infection by *Toxoplasma gondii* because antibody is detected in a single serum sample, he stated.

From studies of the "normal" populations of some 11 different areas of the world, he presented several examples to show why a single sample may not be sufficient.

A positive test may have considerably more significance in some areas than in others, he said.

Feldman used lantern slides to present his evidence on how and where man acquires this infection and made the following observations:

1 From information gathered from congenital cases, different seasons apparently do not carry significantly

different degrees of risk for acquiring infection.

2. From tests of various animal serums for antibody content, dogs and cats appear to be possible reservoirs for the disease in humans.

3. There is no evidence as yet that the disease is transmitted from human to human. It has been found, however, that most husbands of mothers of congenitally infected infants have no serologic evidence of previous infection.

More studies of "normal" human and animal populations are needed to complete the information on the spread and acquisition of the disease, he pointed out.

### Diagnostic Procedures

Feldman discussed four procedures for diagnosing toxoplasmosis: isolation of the organism from tissues and cerebrospinal fluid, the dye test for serum antibodies, the complement fixation test, and the skin test.

Noting that the dye test is an extremely sensitive method of demonstrating antibodies for *Toxoplasma*, he outlined the procedure.

Dye test antibodies develop quickly, reaching high levels within about 2 weeks after onset of infection, and persist in a slowly diminishing titer for many years if not for the life of the individual, he remarked.

Since complement-fixing antibodies appear slowly and tend to disappear fairly rapidly, it is possible to encounter a highly positive dye test in the presence of a negative complement fixation test, he pointed out, recommending that if there is any question about the serologic data, a second serum be examined about 2 weeks after the first.

If the complement fixation test remains negative, the probability that there is an active infection can be discounted, he said.

In Feldman's opinion, the skin test is of no value in a specific diagnostic problem. If it has any usefulness at all, he said, it is as an epidemiological tool in surveys.

The newer serologic procedures,

he commented, have helped elucidate the spectrum of the clinical expression of infection with *Toxoplasma*. For example, it is known that congenital toxoplasmosis may be manifested by chorioretinitis, cerebral calcifications, disturbances in the head size, psychomotor retardation, and convulsions, he stated.

He said he found almost every surviving patient to have had chorioretinitis and about half to have had each of the various other evidences of damage.

## Seek Clues to Outbreak Of Infectious Hepatitis

An outbreak of infectious hepatitis in a suburb of Detroit, Mich., during the fall and winter of 1953-54 emphasizes the difficulties surrounding the epidemiology of this disease, maintained William R. Stinger, M.D., M.P.H., of the Wayne County Department of Health, Elioise, Mich.

These difficulties, Stinger said, are: (1) the existence of subclinical infections, (2) nonspecific laboratory tests, (3) varying clinical manifestations, (4) poor reporting, and (5) multiple transmission routes.

The outbreak also emphasized that good personal hygiene and the proper disposal of sewage are of utmost importance in the control of infectious hepatitis; that children are attacked more frequently than adults; and that gamma globulin is an effective prophylactic agent when administered prior to the prodromal stage of the disease, Stinger declared.

Positive diagnosis of infectious hepatitis was established for 42 persons, not including any person without clinical or laboratory evidence of liver involvement. The outbreak attracted attention in January 1954 when a public school principal reported that several students and a teacher were absent from school because of jaundice, Stinger stated.

Investigation by the health department included, first, interviews

with school authorities, patients, parents of patients, and attending physicians, and, second, interviews with all students and teachers who had been absent from school during October, November, or December and consultations with local physicians and clinic and hospital personnel, he said.

Of the 36 school children ill with infectious hepatitis, 32 attended the school from which the report came, Stinger said. Another patient was a teacher at this school, and 4 more patients were household contacts of one or more of the children at this school.

## Survey of Sanitary Facilities

Stinger reported that a survey of the sanitary facilities at the school where the initial cases occurred revealed several situations that suggested the possibility of back-siphonage of sewage into the school's water supply.

It cannot be proved, however, that any of the conditions were partially responsible for transmission of the disease in this outbreak, he stated.

The survey also indicated that, although facilities for hand-washing were available, soap and towels were often lacking, he added.

Concerning sex and age distributions of the cases, Stinger reported that 26 of the patients were males and 16 were females and that 35 were in the age group 5 through 14 years.

He pointed out, however, that the age distribution may be partially due to more intense case finding in the school populations.

Interviews of household contacts of all patients about 3 months after the onset of the last reported case showed that only 1 case of infectious hepatitis occurred among the 67 contacts who received gamma globulin. This person, however, had received the globulin 4 days prior to the onset of the disease, Stinger noted. Four cases occurred among the 64 contacts who did not receive the globulin, he specified.

## Healthy Bats Suspected As Rabies Carriers

The Mexican free-tailed bat may be a carrier of the rabies virus, preliminary studies in Texas have revealed. This insectivorous species, *Tadarida mexicana*, is a member of the family Molossidae, whose habitat in this country is Texas and other westward States.

As a result of their studies, Lt. Col. Kenneth F. Burns, VC, USA, and Col. Charles J. Farinacci, MC, USA, of the Fourth Army Area Medical Laboratory, Fort Sam Houston, reported finding the inapparent infection of this species with the virus of rabies. This new observation, they said, has considerable epizootiological and epidemiological significance, suggesting the existence of "healthy carriers of this disease." Seven cases of human rabies were reported in Texas during 1952-53.

The feeding and breeding habits of *T. mexicana* permit chance rabies infection from the bites of a known carrier, the vampire bat *Desmodus*, they noted. Recent reports of bats attacking humans and the confirmation of rabies in insectivorous bats offer an additional explanation of how the disease may move from place to place in rapid succession, they explained. Attacks on one species by another have been witnessed. Infected vampire bats may therefore transmit rabies to insectivorous bats under natural conditions. Insectivorous bats, when rabid, may bite other mammals.

Burns and Farinacci speculated about the possibility that *T. mexicana*, even though apparently normal and healthy, may constitute a reservoir of rabies. This would lead to the perpetuation of the disease in wildlife and to the occasional infection of humans, they said. The higher the incidence of rabies in animals, the greater is the opportunity for human rabies, the officers said. They urged control measures aimed

at reducing possible reservoirs of rabies.

### *The Bat Survey*

According to the researchers, a bat survey was begun early in 1954 at the Brooke Army Medical Center, Fort Sam Houston. Only the external characters of the bats collected were identified; all were classified as *T. mexicana*.

The first collection netted 32 apparently physically normal bats. At the time of the second collection, which yielded 35 bats, deranged behavior, muscular tremors, urine incontinence, and parietic manifestations were observed among the bat population. Scores of deaths were recorded. At first these symptoms were attributed to the effects of an intensified DDT program in the area.

While the DDT program was under way, five additional bats were brought in. One was found in a state of spastic paralysis, hanging from a screen door. Three others evidenced paralysis, and the fifth had symptoms of encephalitis. Other collections of apparently normal bats were later taken.

All collections produced 207 bat serums which were divided into pools and stored at a freezing temperature until tests could be performed. Neutralizing antibodies were observed in the serums from apparently normal healthy bats, indicating past experience with rabies. Statistical significance was attached by Burns and Farinacci to the high percentage of bat serums which were positive for neutralizing antibodies. Inactivation of the bat serums did not eliminate the rabies virus neutralizing substance in the blood.

Burns and Farinacci said, "The plausible explanation appears to be that this virus inactivator is specifically related to immunity."

Two isolates were obtained. Tests with infected mouse brain tissue against known rabies immune horse serum demonstrated that the immune serum neutralized both its homologous virus and the two newly isolated bat strains. Negri bodies had

previously been observed in the brains of the bats from which the isolations were made.

"The high percentage of bat serums which contain neutralizing antibodies is probably a result of sur-

vival from rabies infection, possibly in inapparent form," Burns and Farinacci suggested. However, the presence of rabies virus in the brains of nonsanguivorous bats does not necessarily establish that they are

### **William Thurber Fales**

Dr. William Thurber Fales' concept of the service a vital statistician can give to the community in which he lives and works may prove to be his greatest contribution to his chosen field of demography.

Dr. Fales, whose home base from 1934-53 was the statistics section of the Baltimore Health Department, saw very clearly the value of the registrar function to the individual citizen, the clinician, the epidemiologist, and the health administrator.

But he also had the idea that vital statistics were "vital" and were related to such varied social programs as education, traffic provisions, housing, policing, and recreation.

It was this concept that led him to obtain population tabulations for the city of Baltimore on the basis of enumeration districts and to work with the Bureau of the Census in 1940 in developing enumeration districts that could most easily be correlated with the subareas a city uses for administrative purposes—school, police, voting, and health districts.

It took Fales some time to get this material into shape and to correlate it in a working fashion with the flow of births and deaths—his primary task. When he once had this information, he was the demographer for the city by the sheer force of the fact that he knew more about the population of Baltimore than anyone else—and he gave what he knew in order that the data might obtain their greatest usefulness.

Many times, reports and activities completely changed form and direction after city officials had consulted Fales.

Fales engaged in national and international activities—such as the National Health Inventory, the President's Commission on the Health Needs of the Nation, and the International List of Diseases and Causes of Death—as well as city and State. But he always kept clearly in mind the fact that the force of his contributions to social problems came from his knowledge of vital statistics and from his ability to apply this knowledge to the problems at hand.

I feel sure that any trained vital statistician who can get Fales' concept of the power that comes from knowing more about the population and its flow of births, deaths, and migration than anyone else in the area can carve out for himself a career as interesting and valuable as Fales'.

—LOWELL J. REED, *President,*  
*Johns Hopkins University*

capable of transmitting the disease, even though unprovoked attacks on humans by certain of these species are known to occur, they remarked.

## Oral Penicillin Effective In Navy Outbreaks

Oral penicillin offers a safe, practical, and inexpensive way to control epidemics of streptococcal infections, according to Comdr. John R. Seal, M.D., head, Communicable Disease Branch, Preventive Medicine Division, Navy Department.

Penicillin prophylaxis is not considered a desirable or final answer to the problem of controlling epidemic streptococcal infection, he declared. Rather, it is an interim measure to allow emergency control, he said.

Epidemics of streptococcal infections and rheumatic fever can be abruptly terminated through the use of 500,000 units of oral penicillin daily, he said.

If continued for 10 days or longer, this dosage will eliminate streptococci from most infected persons and provide more or less prolonged residual suppression of an epidemic, he said.

Reactions to oral penicillin are negligible, and strains of streptococci resistant to this antibiotic have not been found, he asserted.

### Objectives and Results

Studies were started in 1951 to find the smallest dose of oral penicillin which would effectively suppress streptococcal epidemics and to learn the smallest practical dose for prophylaxis, Seal related.

Doses from 50,000 to 500,000 units daily were used for suppression of epidemics, he said. All doses employed seemed to have some efficacy in converting throat cultures from positive to negative, he remarked, but it was not until a dose of 375,000 units daily was reached, that a marked decline in carriers resulted.

The most dramatic effect was obtained from a dosage of 500,000 units of penicillin daily, he said.

Treatment was begun on a Saturday night. On Sunday, 2 patients with scarlet fever and 1 with clinical evidence of other streptococcal infection were found. Thereafter, during 2 weeks of prophylaxis, he reported, no further patients with streptococcal infection were found.

No rheumatic fever occurred in one regiment in an 18-week period following the end of a course of prophylaxis with 500,000 units of oral penicillin after 12 cases had been admitted in the 7 prior weeks, he reported.

Results with a single daily dose of 50,000 units in two other regiments differed considerably from those obtained with 500,000 units, he commented.

Admissions for streptococcal infections were markedly reduced, but not terminated, and the relative prevalence of specific types of streptococci was not altered, he said.

Carrier rates and the frequency of rheumatic fever seemed to be reduced, he added.

### Reactions, Costs

With few exceptions reactions to oral penicillin were a mild, transient urticaria, he said.

Of 39,615 recruits treated with penicillin, 134, or 0.34 percent, reacted, he reported.

The average cost of 250,000 units of oral penicillin twice daily is about 3.3 cents per day per man in military populations, he reported.

The 50,000 unit dose costs less than one-half cent per man per day, he added.

## Care of the Chronically Ill . . .

*Progress in the control of chronic disease is reported and suggestions are made for greater progress in the future. Referral systems, rehabilitation of "poorhouse" inmates, conservation of hospital services, epidemiological and statistical studies, and new laboratory tests to diagnose the chronic diseases will help to develop procedures for the care of the chronically ill and for the restoration of many of them to useful life in the community.*

### Facilities Planning Accents Chronic Disease Problems

The new medical facilities survey and construction program offers States and communities the opportunity of crystallizing their thinking on the whole chronic disease problem, according to Surgeon General Leonard A. Scheele.

Under the new act, fiscal year 1955 appropriations amount to \$2 million for use of States in conducting sur-

veys to determine their needs for chronic disease facilities, diagnostic treatment centers, nursing homes, and rehabilitation facilities. A \$21 million construction appropriation has been made available until the end of fiscal year 1956.

Although the current level of appropriations will not add more than a drop to the almost empty bucket of facilities, the Surgeon General said, the initial projects can be courageous experiments—beacons in each State and throughout the country.

Or they can be "just more space-fillers," capable only of perpetuating many past errors in dealing with long-term illness.

The Surgeon General stressed the need for finding better ways of financing long-term care and for the adoption of new concepts about chronic illness.

### *Financing Rugged*

Voluntary health insurance has made an excellent start, but current insurance benefits tend to pick up only the small end of the check, he said, adding that the resources of the patients and their families, as well as of public and private welfare agencies, public medical and hospital programs, and philanthropic institutions are severely taxed to carry the residual burden of long-term illness.

He expressed the hope that voluntary health insurance agencies, along with other private and public organizations, will develop and test in communities new plans for a more equitable distribution of the medical and hospital expenditures for long-term illness.

### *New Concepts*

Concepts generally held for the past half-century tend to equate long-term illness with incurable diseases that follow a rigid pattern of degeneration and death or with invalidism as an inevitable event in old age, he said. Regrettably, he added, these concepts also foster the assumption by society that the only solution is to provide enough institutions in which to store the unwanted victims of long-term illness.

We are learning, he said, that prolonged disability can be transformed into prolonged ability to work and live like healthy folk, or at least to take care of one's daily needs with little or no help.

The Surgeon General called for the acceptance of the concept that most of the patient's care can be provided in facilities within his own community. "Until we get that new concept firmly fixed in our think-

ing," he said, "we will go on emphasizing first the large and costly outside institution, and only last—perhaps too late—will we turn to the community general hospital and its outpatient department, the community health department, the local physician's office, and the patient's own home as appropriate settings for his continuing care."

Citing the community need for more different kinds of services than are commonly available today, he pointed out that only a few large cities have developed to a reasonably high degree home care programs which include medical, nursing, social, and housekeeper services, and physical therapy; ambulatory services offering diagnosis, therapy, and followup; and comprehensive rehabilitation services.

He discussed, as other important parts of the chronic disease picture, research and experimentation in care, combined planning by all the groups involved, and scrutiny by each organization of its own policies and operations in the whole area of long-term illness.

### *Study and Research*

The Surgeon General gave as an example of the studies and demonstrations needed in the whole field of long-term illness the projects of pioneering mental institutions. Some mental institutions, he said, "have made additions to their professional staffs for intensive treatment of selected patients who have been returned to their communities under hospital supervision. Others have set up outpatient departments, thus shortening the stay of many patients and avoiding many readmissions. Some are experimenting with foster home care; others with arrangements for allowing rehabilitated, but homeless, mental defectives to work in the community and return to the institutions at night."

In line with integrated effort, the Surgeon General reported that an Inter-Bureau Committee on Chronic Illness has been set up within the

Public Health Service's Bureau of State Services and includes representation from the Office of the Surgeon General, the Bureau of Medical Services, and the National Institutes of Health. The committee has a charter, he said, to explore and report on all Public Health Service activities in the chronic illness field—research, medical and hospital services, facilities, and public health programs.

### **Maryland Referral System Set Up for Chronically Ill**

A referral system that will help each chronically ill patient find and use the most appropriate community service and thus use the chronic disease hospital only when he belongs there was advocated by V. L. Ellicott, M.D., Dr.P.H., acting director, chronic illness program, Maryland State Department of Health.

Many chronic disease hospital beds are filled by custodial patients whose conditions cannot be improved. Such usage interferes with the hospital's primary function as a dynamic treatment center, Ellicott declared.

In the absence of adequate referrals, he said, the new patient who should go to a nursing home is too frequently allowed to go to the chronic disease hospital simply because the path to the hospital is established while the path to the nursing home is not. The patient who is due for a transfer from the hospital to a nursing home will stay in the hospital if no one is made responsible for finding a bed in a nursing home or because a technicality prevents a welfare board from certifying his financial status, he added.

Integration of the services of the chronic disease hospitals, the other hospitals, nursing homes, welfare boards, local health units—which provide health services to patients at home—and various other participants, Ellicott said, requires agree-



ment on the following basic concepts:

1. The patient must be able to reach any service he needs, whether it be rehabilitation or custodial care, and whether the patient is indigent or not.

2. Provision must be made for social service guidance and for smooth and prompt transfer of the patient from one service to another.

3. A competent agency or group must assume responsibility for solving any problem which may keep the patient from receiving service.

Maryland, Ellicott reported, has recently set up machinery for correlating its two State-operated chronic disease hospitals with other services. Both the hospitals and the integration program are operated by the State health department, he noted.

It will be the job of those directing the chronic illness program, Ellicott observed, to get cooperation: to increase understanding of the types of services available and the channels for referrals; to supply current lists of vacant nursing home beds to chronic disease and general hospitals; and to set up a consultation service for families and professional workers who need help in selecting the most appropriate facilities for various types of patients.

## Allegheny County Restores "End of Line" Inmates

The hapless, hopeless, helpless "poorhouse" occupant can be transformed into a cheerful, conversant, and animated individual, the Allegheny County Institution District in Pennsylvania has found in its 8 years of experience with a physical restoration program at its Woodville and Mayview facilities for the indigent ill.

Too many county institutions practice debilitation rather than rehabilitation, declared Murray B. Ferder-

ber, M.D., assistant professor of medicine, University of Pittsburgh School of Medicine and consultant in physical medicine and rehabilitation to Allegheny County.

In 1946, he said, few medical personnel—institutional or private—felt that the county home candidate offered any chance for physical redemption. This "end of the line" concept did not reckon with the physical and emotional resurgence possible for even the aged under a regimen of good medical care, social services, and physical therapy, Ferderber indicated.

In calling for a revised attitude toward county institutions, Ferderber pointed out the reasons that may make admission to a public facility necessary. The course of productive convalescence may be too long and costly for private care; home care may take a wage earner out of circulation; the family may be unable to continue with the prescription; and the health of other family members might be impaired, he said.

## Then and Now

Formerly upon admission to Allegheny County facilities, Ferderber related, the patient was "parked," given a routine examination, and the cursory "poorhouse" care, and left to exist socially as best he could.

Today, upon admission the physician follows the accepted routines of good medical care, basing his diagnosis on history, physical examination, and laboratory data, he said. The physician sets down definitive orders for the particular disability and pathology. The social service department integrates its information simultaneously.

The "team"—the physician, nurse, therapist, social worker, physiatrist, and the orderly-attendant—meet at the patient's bedside to discuss the problems. The bedside meeting, Ferderber said, immediately dispels the patient's primary fear of neglect and constitutes the first step toward physical self-sufficiency.

The therapist and aide combine

efforts on indicated bed exercises and simple techniques that will prevent the deformity, bed sores, and other unnecessary results of excessive bed and chair fastness, he reported.

The next step, when the patient can be transported by wheelchair, he said, is the simply equipped therapeutic gymnasium for physical rehabilitation. The disabled engage in exercises commensurate with their ability, and in the course of this group participation the vacuous, stolid expressions of institutional apathy disappear, he said.

At least once monthly the rehabilitation board, composed of the staff physician in charge, social worker, rehabilitation technician, aide, and physiatrist, meets to discuss the needs and disposition of the patients.

## New Quarters

Physical restoration will be enhanced in a new county institution now under construction near Pittsburgh and expected to open in late 1956, Ferderber said. The institution will house about 2,200 patients and provide a well-equipped hospital for the needy ill with the exception of a surgical pavilion.

The institution district expects to follow its present procedure of calling in consultants and, when needed, of transferring the patient to the consultant's hospital for surgery, he said. The new building will provide simple egress for at least 1,100 ambulatory patients to park areas without the need for using steps and elevators. An auditorium built in four tiers will eliminate the use of elevators, ramps, and steps, and provide the patients with entertainment and recreation, he concluded.

## Advocates Conservation Of Hospital Services

General hospitals will serve most effectively as powerhouses, not storehouses, in the treatment of protracted illness, C. Rufus Rorem, P.



tive director of the Hospital Council of Philadelphia, stated.

For some prolonged illnesses, he said, the hospital has served mainly as a dormitory with only occasional interludes requiring professional health services. He advocated conserving the use of hospital personnel, equipment, and buildings for professional health services.

Roem offered several other points for the comment, criticism, and action of professional and community groups in organizing health services for chronic illness.

Home care for chronic illness will achieve its destiny only when it is regarded as a professionally desirable procedure, not merely a "poor relation" of hospital inpatient service, he predicted. Most home care experiments administered by hospitals have developed from overcrowded conditions in their wards, Roem pointed out. He commented on the importance of recognizing that a person may be a "hospital patient" while receiving supervised care in his home.

Experimentation in improved care of prolonged illness need not wait upon new construction of facilities, Roem observed.

He pointed out, "If home care administered by visiting nurse societies can avoid the need for additional hospital beds, such ventures should be encouraged. If circuit rider medical services to homes for the aged can serve the health needs of most of the residents, the individuals, the hospitals, and the community will gain by the procedure. If existing homes for the aged and infirm can extend their recreational and personal services to elderly individuals living at home, they may reduce some of the illnesses attendant upon loneliness and boredom."

Roem also predicted that outpatient services for long-term illness will become increasingly important at hospitals, particularly for specialized procedures. They will conserve the professional energies of the attending physician.

The problem for individuals, pro-

fessional groups, institutions, and the general public is to develop health services in accord with changing patterns of homelife and community organization, Roem said. One thing seems clear, he concluded, there will need to be some changes made in the organization of health service, as well as in the sources and methods of financial support.

## Uses of Epidemiology In Chronic Disease

Many epidemiological studies are "case series in search of a universe," said Philip E. Sartwell, M.D., M.P.H., professor of epidemiology, Johns Hopkins University, School of Hygiene and Public Health, in his discussion of the various approaches to the epidemiology of chronic disease.

Information is readily available on the characteristics of patients with a given illness, he said, but if the relationship of these characteristics to the disease is to be learned, their frequency in the population must be established. That is, a series of clinical histories must be related to the universe out of which they arose.

This, said Sartwell, is the task of the epidemiologist, and success may provide a clue to an unrecognized cause of the disease or even lead to a well-supported etiological hypothesis.

## Source of Data

Pointing to the Federal census as the most obvious source of "denominator" information, Sartwell said, however, that knowledge of many chronic diseases already includes a rough idea of their distribution in reference to the data furnished by the census on age, sex, race, geographic distribution, and some other characteristics. Needed, he said, is an investigation of factors which are not as well known.

One approach to gathering these factors, he continued, is the type of community survey which after re-

peated house-to-house canvassing of all the families in 24 villages helped to identify the cause of pellagra in 1921. The objectives of the method are, at the same time, to find cases of a disease and to obtain denominator information on the population in which the cases appeared. Mass screening surveys are capable of furnishing similar information when appropriate information is secured on the population examined. Sartwell characterized this approach as too expensive and difficult to be used for rare illnesses or in any situation in which there is not already a hypothesis to be confirmed.

Refinement of the denominator data is possible when the population under study constitutes a defined group from whom specific information is routinely secured, such as employees of an industry or life insurance policyholders. Rates of prevalence, incidence, or mortality may be obtained which are specific for such factors as, for instance, occupation.

## Random Sample

Instead of trying to learn the characteristics of the entire population, an alternative approach is to draw a random sample of the population, matched for age, sex, and race with the series of cases. Much more detailed information can be secured from such a control group than would be possible from the whole population. The frequency of the attribute in which we are interested can then be studied in the controls as compared with the cases. Sometimes, when the cases are a series of hospitalized patients, persons hospitalized with other diseases may serve as controls, although they are less satisfactory in some ways.

If an association is found by any of these methods between an environmental factor and the occurrence of a disease, it must be rechecked through repeated studies by independent methods. This may lead to the development of a more specific and useful hypothesis, the rejection of the whole idea, or to a completely

new avenue of inquiry. The long final step, from association to causation, is taken only after assembling information from all sources, demonstrating its consistency, excluding the possibility of indirect association, and if possible supporting the hypothesis with experimental laboratory evidence.

## Urges Laboratories Develop Chronic Disease Tests

Just as in the past the public health laboratory has served the physician in his diagnosis and treatment of infectious diseases, it can serve him in the future in the control of chronic diseases, asserted Seward E. Miller, M.D., chief, Division of Special Health Services, Public Health Service.

The public health laboratory has an actual responsibility to help solve the main health problems of the day, he declared. Today, there is need and opportunity for further development of diagnostic tests, both general and specific, for the more than 50 chronic diseases to which our older population is susceptible, he said.

Of the three main services performed, research, diagnosis, and teaching and training, the major contribution of the public health laboratory is the development and application of diagnostic procedures, Miller commented. Equally important, he added, is the training of personnel in some of the newer diagnostic techniques as they are developed.

### Clinical Diagnoses

Clinical diagnosis by laboratory examination has become an indispensable aid in medicine and surgery, he asserted. Present knowledge of the major chronic diseases, however, he pointed out, varies widely in the availability of diagnostic procedures.

Miller then reviewed the diagnostic status of arthritis, cancer, di-

abetes, and heart disease and discussed multiple screening and its relationship to clinical diagnosis.

Among the procedures needed, he said, is a test for rheumatoid arthritis. The National Institute of Arthritis and Metabolic Diseases, he reported, is now working on a serologic test which it is hoped will be as specific as the syphilis and diabetes diagnostic tests.

Another urgent need, Miller said, is a general test for the detection of cancer. The ideal test, he commented, would be applicable to most anatomic sites of the body, and could be easily and economically given to a large number of persons.

Not all of the responsibilities of the public health laboratory are associated with disease entities, Miller said in pointing out that there is a tremendous challenge in the problem of guidance for antibiotic therapy resulting from the introduction of antimicrobial agents.

Guidance, he maintained, should be the key word in the relationship with privately owned laboratories. The public health laboratory should not compete, but lead the way, training personnel and providing standardized solutions or reagents. Closer collaboration could facilitate solution of some of the diagnostic and therapeutic problems in chronic disease.

## Insurance Study Affords Long View of Diseases

The value of a 1951 medical impairment study as a unique source of new data on the long-term effects of diseases and physical conditions was underscored by Edward A. Lew, actuary and statistician, and Herbert H. Marks, manager, medical statistics, of the Metropolitan Life Insurance Company.

This study, made under the auspices of the Society of Actuaries, included the experience of 27 large life insurance companies on 625,000 persons with specific medical impair-

ments to whom policies were issued at standard and substandard rates between 1935 and 1949 and who were traced to the policy anniversary in 1950.

Some 132 groups of impairments are included in the study. The average period of observation was slightly more than 6 years. The study results are presented in the form of ratios of actual deaths to the number of expected deaths if the mortality had been the same as that experienced by persons insured under standard ordinary policies during the same period.

Terming the study a "classical example of long-range followup studies," Lew and Marks enumerated the characteristics of the data:

1. The study group, drawn chiefly from white male adults in the middle to higher income brackets, represents a highly selected sample of the population. Their selection for ordinary life insurance presumes a good state of health.

2. Virtually all of the persons were medically examined. Frequently, supplementary information was obtained from the individual's physician.

3. The results of the medical examinations have been generally reported in terms of specific findings, not in diagnostic terms. Example: constant systolic murmur at the apex, *not* rheumatic heart disease.

4. The data represent the results of average medical care rather than care by selected specialists or clinical groups.

5. The survivorship record of the individuals included can be accurately evaluated by reference to the contemporaneous experience among all persons to whom life insurance was issued at standard premium rates during the period of the study.

6. The findings can be compared with information contained in earlier impairment studies of the kind.

### Some New Facts

The conclusions can be useful to public health workers in evaluating

programs, estimating future case-loads, and in keeping the public informed about the outlook for persons with various medical impairments, Lew and Marks said. Such statistical studies may be expected to shed light on the natural history of chronic diseases, they added.

Selected findings which bear on traditional public health problems were reported. Among them, briefly stated here, were these:

**Pulmonary tuberculosis.** Underweights experienced mortality no higher, and in some instances, lower than persons of average or above average weight. The extra risk of death from the degenerative diseases of later life associated with even a slight degree of overweight currently overshadows the extra risk of death from tuberculosis and other respiratory diseases in the long-range picture. The need for continuous medical supervision of persons with a history of active tuberculosis is indicated by the excess mortality from the disease in this experience.

**Coresidence with tuberculosis.** Contacts are subject to an appreciable extra risk of acquiring the disease and might, therefore, benefit from periodic medical checkups.

**Rheumatic fever.** Relatively high mortality among the cases under 30 at time of policy issue points up the sizable risk of its recurrence, even though a considerable time may have elapsed since the last attack and no evidence of heart damage is found on examination. Mortality was even higher among cases with a history of rheumatic and streptococcal infection who were found to have a systolic murmur over the apex of the heart and especially so when the heart was enlarged.

**Diseases of the cardiovascular system.** Among persons with two or more close relatives under age 60 with heart or related disorders, the death rate was significantly higher than normal, primarily because they, too, experienced excess mortality from these cardiovascular conditions.

**Poliomyelitis.** For those issued

standard insurance, despite the crippling effect of the disease, the mortality was about the same as for standard life insurance risks. Among the cases with more serious degrees of crippling, who were limited to substandard insurance, the mortality was about one and one-half times the expected.

**Syphilis.** The results in the carefully selected cases accepted for life insurance indicated that adequate treatment of syphilis by earlier methods (heavy metals) was apparently successful for many.

**Maternal hygiene.** Women who have had a child delivered by cesarean section run an extra risk in subsequent pregnancies, but the operation itself has no adverse effects on the longevity of the mother.

**Mental disorders.** Suicide accounted for a major portion of the excess mortality among persons with a history of neurasthenia, psycho-neurosis, or of psychosis. An above-normal suicide rate was recorded also in those who reported a history of insanity in two or more close relatives under age 60.

## Insecticides and Pesticides . . .

*The subject of DDT toxicity and the potential hazards involved in the use of the cholinesterase-inhibitor group are reviewed. The role of pesticides in agriculture and the Federal regulations for testing and controlling pesticides prior to marketing also are discussed.*

### Cholinesterase-Inhibitor Group Reviewed

A great deal of confusion and lack of understanding exist concerning the potential hazards of organic phosphates of the cholinesterase-inhibitor group such as parathion, malathion, Diazinon, Shradan, and Systox, when they are used as pesticides, declared L. W. Hazleton, Ph.D., president, Hazleton Laboratories, Falls Church, Va., in spite of the fact that rarely has so much been known about a class of chemicals and its individual members before they are put to constructive use.

Some of these materials are relatively nontoxic; others are acutely hazardous, Hazleton said. All are toxic following oral administration, dermal application, or inhalation of particulate matter.

The danger to the user or to the general public is no greater than the hazards from other commonly used industrial and agricultural chemicals, Hazleton stated. Danger is practically nonexistent, he said, because of the nonresidual nature of the chemicals, the intensive research made by industry, and the vigilance of the authorities regulating their manufacture and use.

Both Federal and State authorities require manufacturers to make extensive toxicological studies on each pesticide before it can be put on the market, he said.

### Hazards to Workers

Persons engaged in the manufacture and formulation of organic phosphate pesticides and those who handle them in concentrated form are in danger of toxicity and should be protected from exposure, Hazle-

ton warned. However, industrial hygiene techniques have practically eliminated hazards under these conditions, he said.

Individuals continuously exposed to these chemicals should have periodic checks on cholinesterase activity; those who complain of symptoms which might be associated with exposure to pesticides should be referred to a physician who is familiar with pesticide poisoning.

Although information regarding safe handling of the cholinesterase-inhibiting pesticides is available, occasional accidents occur because of failure to follow directions and carelessness in handling the material. Fortunately, recovery from both acute and subacute toxicity is complete, with no residual storage or pathology.

## Pesticides Must Be Tested Before Approval for Use

Pesticides can no longer be placed on the market without first being thoroughly tested, reported Justus C. Ward, M.S., in charge of the Pharmacological and Rodenticide Unit, Agricultural Research Service, United States Department of Agriculture.

### *The Insecticide Acts*

The Insecticide Act of 1910, which until 1947 was the principal Federal statute dealing with pesticides, related only to performance and purity, Ward continued. However, it became apparent that certain classes of pesticides which were not included in the 1910 law also needed control, and that many other features of poison handling were highly important, he said. This was particularly true, he said, from 1935 on, when new and spectacular insect, weed, and rodent killers presented problems for which there were no answers.

In June 1947, Ward said, the Federal Insecticide, Fungicide, and Rodenticide Act became law, and indis-

criminate introduction of new and strange poisons into interstate commerce was immediately halted. This law required registration and clear labelling of poisons so that the user would know upon reading the danger involved in handling them, would know how to avoid injury, and, also, would know how to use the material to avoid destroying beneficial forms of life.

In addition, the law allowed controls over dosages of the pesticide that "would guarantee that the residues left on food crops would be within acceptable limits."

The 1947 act authorizes the Department of Agriculture, which is responsible for enforcement of the law, to consult on hazard problems of new poisons with the Public Health Service and evaluation of food residues with the Food and Drug Administration.

### *Extent of Testing Varies*

There are many complex tests to be performed before a research chemical becomes a pesticide, Ward stated. When a use for a chemical has been discovered, the commercial agency which will exploit it must make a minimum toxicological evaluation to determine its acute oral toxicity, its skin absorbability, and its inhalation hazard.

The use for which the chemical is intended will then determine whether further study is needed, and how much. For example, if a chemical to be used in agriculture presents no unusual hazards to the person using it and the precautionary labeling has been approved by the Public Health Service, it could be approved for use as an insecticide on nonfood crops. Long-term pharmacological data and adequate chemical residue analysis would be necessary before it could be used on food crops.

### *Household Pesticides*

Household pesticides which require protective clothing and special equipment should be used only by professional pest control specialists,

the speaker said. Sprays for use in the home require the collection of extensive data on oral toxicity, skin absorption, and inhalation hazard. If the product is to be used in any way so that it will touch the skin, studies on skin irritation or sensitization must be done. If it is to be used as an aerosol or hand spray, repeated inhalation tests are necessary.

### *Protection Increasing*

The law also permits the Secretary of Agriculture to cancel full registration. This action must be followed immediately, however, by the issuance of a registration under protest. This is accomplished by a letter to the manufacturer detailing why the action was taken. Such a procedure, Ward stated, permits prompt action in notifying a manufacturer that unfavorable use experience has indicated need for curtailing distribution of his product.

A great deal of progress has been made in the control of poisons since the act of 1947 was passed, the speaker concluded, and as the laws are amended controls become more precise. "The public is demanding increasing protection against insidious chemical agents, whether they may be smog, car gas, industrial fumes, strong drugs, household chemicals, intentional food additives, or pesticides," Ward stated.

## Toxicologist Reviews DDT Intoxication

DDT is a safe material for men to use, Wayland J. Hayes, M.D., Ph.D., chief, Toxicology Section, Technology Branch, Communicable Disease Center, Public Health Service, Savannah, Ga., reported in reviewing present knowledge about DDT intoxication.

Abundant evidence is now available about human exposure to DDT, and such quantitative information should help satisfy any reasonable doubts about the safety of this chlor-

inated hydrocarbon insecticide, he said. Cautioning against alarm because of the need for additional research, he stated that human beings can withstand much greater exposure and storage of DDT than are now prevalent.

### *Today's Knowledge*

"The greatest recent advances in our knowledge of DDT are those which define the current exposure and the magnitude of tolerable dosages involving this compound," Hayes stated.

Because a greater tonnage of DDT is produced than any other insecticide—because it occurs as residues in food—and because it is stored in human tissue, interest in the material, already the subject of advanced chemical analysis, continues, he commented. Much remains to be learned about its toxicology and pharmacology, and about its basic mode of action.

Careful studies with extensive occupational exposure are proving the safety of the material, he added, in calling attention to these observations: In spite of the tremendous tonnage of the compound being used, the total number of reported cases of dermatitis from DDT is very small; the number of accidents has been very small; there is no well-described case of fatal, uncomplicated DDT poisoning; except in severe cases, recovery from mild poisoning has always been well advanced or complete in 24 hours; no instance of chronic DDT poisoning in man has been confirmed; and dermal exposure under conditions of actual use has not been sufficient to produce systemic poisoning.

More occupational disease has been caused by the solvents in DDT formulations than by the compound itself, Hayes pointed out. A number of deaths have been reported following the ingestion of DDT solutions, which are obviously dangerous to drink. Experiments with animals have revealed that digestible animal and vegetable oils enhance the toxicity of large doses of DDT. Kero-

sene, the most common solvent for this compound, has a considerable toxicity for man, a fact not fully appreciated.

The suggestion that DDT is the direct cause of a viruslike disease and of a psychoneurotic syndrome, as well as a contributing cause of poliomyelitis, hepatitis, cardiovascular disease, cancer, and a formidable array of animal diseases, finds no support in animal experiments or in human morbidity or mortality statistics, he remarked.

### *Our Daily Diet*

Fatty foods, or foods cooked in fat, tend to contain more DDT than other foods, but there is no indication that the amount of DDT occurring in our diet or stored in our fat is injurious, Hayes assured. Three well-balanced meals a day yield the equivalent of a dosage of 0.0026 milligram per kilogram per day, which may be compared with that of 0.5 mg./kg./day being taken currently without injury by volunteers, he said.

Hayes reported other findings relating to the effect of DDT on man. Some of these are summarized below:

Oral dosages of 285 mg./kg. have been taken without fatal result. But these and even smaller dosages lead to prompt vomiting so that the amount actually retained cannot be accurately determined.

Still unknown is the least dosage which, when repeated daily, will lead to illness.

No quantitative estimate can be given of the dermal toxicity of DDT to man. Many investigators have found it impossible to determine the medial dermal lethal dose ( $LD_{50}$ ) of DDT because the material was simply not toxic enough. All agree the dermal  $LD_{50}$  of undissolved DDT is extremely high—400,000 mg./kg., or greater.

DDT is broken down by the body. Two of the products, both formed by man, have been identified: DDA, the acetic acid derivative of DDT, is excreted in the urine; and DDE, the

dehydrochlorinated derivative, is stored in the fat. Since it is indicated that significant dosage levels of DDT can be quantitatively related to the excretion of DDA in the urine, it should now be possible to measure objectively the exposure of workers, some of whom have been constantly engaged in the manufacture of DDT ever since its introduction to general use in this country in 1946.

### **Pesticides Save Lives, Aid in Food Production**

Without pesticides, the quantity and quality of our food, feed, and fiber would be drastically lowered, according to H. L. Haller, Ph.D., assistant director of Crops Research, Agricultural Research Service, United States Department of Agriculture. The use of pesticides to control insects saves millions of lives and reduces sickness and misery, he maintained.

Since the introduction of new pesticides, average per acre production of many crops has increased, in some cases by as much as 60 to 70 percent, he reported. Although not entirely due to their use, evidence shows that pesticides are a major factor in increasing the production of onions, potatoes, lima beans, and tomatoes, he commented.

Haller reported that with one-third fewer workers and about the same total cropland as in 1919, agriculture is now supplying a population 53 percent larger and producing better quality foods. However, he asserted, this effectiveness is only comparative and our margin of safety is thin. He pointed out that the losses still caused by crop and animal diseases, by parasites, insects, and weeds have been conservatively estimated at about \$9.5 billion a year in a recent survey.

### *Food and Health*

Emphasizing that good public health is directly related to good

nutrition and not merely the prevention of infection, Haller went on to show that high-quality diets depend on scientific attacks against the fungi, bacteria, viruses, and nematodes which interfere with the productivity and quality of grain, fruits, timber, fiber and other crops.

In the war against weeds, he said that scientists are always aware that an average ragweed plant takes three times as much water from the soil as corn, that mesquite has made worthless 60 million acres of grazing land, that halogeton kills sheep, and that Canada thistle, Johnson grass, field bindweed and others choke and ruin crops. The insect enemies, which destroy crops and contribute to soil erosion as well as transmit diseases to man, he said, add up to an army of more than 700.

"The situation remains nip and tuck," he warned. "Competent agricultural scientists have pointed out time and time again that even a statistically small letup in the fight

could very well set back our agriculture by many years."

## Current Research

Considerable research is needed, he said, to find effective controls for organisms that infest the soil. Tests with some of the new organic compounds have reduced infestations and brought striking increases in crop yields, he reported.

He cited the need for improved grasslands and for development of new herbicides, botanical pesticides, and antibiotics to control bacterial diseases of plants. All effects of chemical agents on quality of produce must be studied thoroughly before widespread use.

The control of insect vectors of diseases has been greatly aided by insecticides, but new compounds are needed because of the resistance to DDT developed by insects, Haller stated. As many as 2,000 new pesticidal compounds are formulated and evaluated every year, he said.

status. They were selected, said Dillard and her associates, so that each school child had at home a pre-school sibling of the same sex and not more than 2½ years younger. Observations were repeated periodically on each child until the pre-school sibling had completed at least one school grade. Of the 66 pairs who began, 54 completed the study.

## Sibling Comparison

Although the minimum deficiency symptoms were noted in about the same proportion of older and younger children, relatively few sibling pairs, said Dillard and her co-workers, showed the same symptoms at the same time, except in the case of long-bone deformities. They said that slightly more than 50 percent of the 56 children showing this condition were sibling pairs.

An apparent improvement in the physical condition of most of the children who received both examinations was indicated, according to Dillard and her colleagues, by a decrease in the observed number of clinical symptoms and by an increase in the number of children whose general appearance was considered good.

The dental caries rate of the children studied was high, but comparable to that reported in other studies on children of similar ages from areas where water supplies contained approximately the same amount of fluoride, 0.5 p.p.m. The average number of teeth that were decayed or filled increased from 2.9 to 5.4 for boys and from 4.3 to 6.0 for girls between the first and final examinations, Dillard and her associates reported.

## Weight Range

They said that over two-thirds of the weights recorded for all children were within the range set by the usually accepted standards for height and age. More weights below 10 percent of the standard were recorded than above the standard. However, since the deviation from

# Nutrition for School Children . . .

*When children in Iowa are not getting enough milk, fruits, and vegetables, as reported in one study, or when only 35 percent of all school children in the country have good diets, as reported in another study, perhaps more emphasis is needed on surveys of opportunities for education in good nutrition.*

## Children's Nutritional Status Studied in Nashville

Only minimal symptoms of possible nutritional deficiency were found in a 3-year study of the food intakes and nutritional status of Negro children in Nashville and Davidson County, Tenn.

A preliminary report on the study was made by Norma P. Dillard, M.A.,

nutrition analyst, and Verz Goddard, Ph.D., both of the Human Nutrition Branch, U. S. Department of Agriculture, Erna B. Jones, M.S., head, department of home management at Tennessee Agricultural and Industrial State University, and Natalie M. Tanner, M.D., of Detroit.

The project, completed in 1952, reported findings for 132 children, 66 pairs of siblings, chosen from families of comparable socioeconomic

standard was greater for the overweight (the highest 44 percent above the standard as compared with a low of 25 percent for the underweight), the average weights fall very close to the standard.

Similarities in the findings for the sibling pairs were most obvious in the data resulting from the blood analyses made twice during the study, said Dillard and her co-workers. Blood serum levels of protein, ascorbic acid, and vitamin A were adequate for the majority of children, but the hemoglobin values were far below those reported by other investigators.

The minimal signs of nutritional deficiency most frequently observed were changes in the mouth, skin, skeletal structure, and teeth, according to Dillard and her colleagues. They said that many of the symptoms noted at the beginning of the study had apparently disappeared when the children were reexamined at its close.

## Classroom Good Place To Teach Nutrition

In serving lunches schools have an excellent opportunity to teach by example, as well as by classroom instruction, how to select an adequate and nutritious diet, stated Austin E. Hill, M.D., M.P.H., director of public school health services, Houston, Tex.

He suggested that schools sell only types of candy that contain ingredients which will supply needed nutrients, such as milk, egg whites, and peanuts or peanut butter, to aid in providing the child's daily protein requirement.

Pointing out the dangers of inadequate nutrition, he said that in this country only 35 percent of all school children have good diets. Poor nutrition, he maintained, is not solely an economic factor because many families in the lower income levels are well fed. The problem is not only one of educating children,

## Number of calories per day needed by children, according to age <sup>1</sup>

Age (years)	Calories required (Girls and boys)	Age (years)	Calories required	
			Girls	Boys <sup>2</sup>
10-12 months.....	1,000	10	2,000	2,000
1.....	1,100	11	2,100	2,200
2.....	1,200	12	2,200	2,400
3.....	1,300	13	2,300	2,600
4.....	1,400	14	2,400	2,800
5.....	1,500	15	2,500	3,000
6.....	1,600	16	2,400	3,200
7.....	1,700	17	2,400	3,400
8.....	1,800	18	2,400	3,600
9.....	1,900	19	2,400	3,800

<sup>1</sup> Interpolated from Recommended Dietary Allowances, revised 1953.

<sup>2</sup> Double the age x 100.

parents, and teachers as to what constitutes a proper diet, Hill continued, but is concerned with application of the knowledge.

Hill defined the type of meals best adapted to supplying children with the daily nutrition requirements. In the table he gives the approximate daily caloric intake needed by children according to age.

He also compared the protein and caloric needs of school children with that of certain adults. For instance, he said a child between 7 and 9 years old needs as much food as the average middle-aged woman; a boy of 15 needs more food than his male teacher or athletic coach; and a 15-year-old girl needs the same amount of food as a pregnant woman. Most parents fail to understand that almost all school children actually need more food than their parents, said Hill.

### Protein Essential

Each day should begin with a good breakfast, high in protein content to help maintain a more constant blood level, Hill suggested. Children should eat at least three foods rich in protein at each meal to assure the full recommended daily protein consumption by bedtime.

"Protein is the most important

diet constituent, and it is the most prevalent deficiency in the diet of school children," Hill declared. A steady loss of protein occurs in the body which must be replaced by a constant and adequate daily intake because proteins are not stored by the body as are carbohydrates and fats, he explained.

## School Lunchroom Survey Reveals Deficiencies

Periodic sanitary inspection of school lunchrooms and periodic review of the way the lunch programs are used for educational purposes were recommended by Charles C. Wilson, M.D., and Eric W. Mood, both of Yale University, on the basis of data collected in a 1954 survey of 795 schools. Dr. Wilson is professor of education and public health, and Mood is lecturer in public health.

These activities, preferably carried out cooperatively by school and health department personnel, will point the way for further specialized investigation and provide the bases for improved school sanitation and health education programs, they declared.

The following survey findings were reported.



## Sanitation Practices

Almost all the schools (731) have an adequate supply of running hot water, and 605 obtain their water from a public water source.

Forty-six percent of the schools have an installed dishwashing machine, and 19 percent, 3-compartment sinks, but 31 percent use 1- or 2-compartment sinks or dishpans.

To the question, "Are food displays covered or shielded by glass or plastic?" only 58 percent answered affirmatively.

Although only 2 schools specified that they did not use mechanical refrigeration, only 462 reported a thermometer in each refrigerator.

Almost half the schools (358) have an insect control problem, and approximately 1 out of every 3 (259) has a rodent control problem.

## Health Education

A majority of the schools (448) require pupils to wash their hands with soap and water before lunch, but 274 do not require this procedure.

Less than half (308) of the schools assign pupils to observe and report on food handling practices, and only about half (304) assign pupils to observe and report on pupil lunchroom practices.

In 50 of the schools, pupils assist in the preparation of food; in 368, they help in serving food; and in 524, they assist in cleaning up the lunchroom. In 518 schools, the children are instructed in sanitary procedures and reasons for the instruction are explained.

Sanitation in public eating places is studied in 64 schools "intensively"; in 543 "casually"; and in 104 "not at all."

## Survey Methods

In this survey, data were collected by two methods, Wilson and Mood specified. For 646 schools, questionnaires were filled out by members of the American School Health Association. For 149 schools, interviews were conducted by graduate students

in public health and by health department sanitarians. Included in the survey sample, they stated, were elementary, junior high, and senior high schools in towns and cities of all sizes in all geographic areas of the Nation.

The increasing scope of school lunch programs was one factor stimulating the survey, they indicated. They estimated, from Department of Agriculture figures on the National School Lunch Program, that 1 out of every 3 school children eats his noon meal in the school lunchroom. Another factor was the occurrence of foodborne disease outbreaks attributed to food and drink served in the school lunchroom.

## School Children in Iowa Lack Calcium, Vitamin C

Even in seemingly well-fed Iowa, there are nutrition problems among school-age children which merit serious attention, according to the findings of a 5-year statewide research program.

Ercel S. Eppright, Ph.D., head of the department of food and nutrition, Iowa State College, reported on the study. The study, she noted, has been probing the tie between what children eat and their general state of nutrition.

Lack of sufficient calcium and vitamin C for all children was so frequent, Eppright said, that the problem might well be tackled in a statewide nutrition education program. For girls 12 years of age and older, lack of sufficient iron was a frequent finding.

Iowa school children tend to follow the eating patterns previously observed for their parents, she stated. They are eating well of such foods as meat, potatoes, fats, and bread and other cereals, but they are not getting enough milk, fruits, and vegetables, the study revealed.

Eppright reported that the mean nutritive value of the diets of the children (except girls over age 12

years) was close to or better than the recommended daily allowances of the National Research Council. This finding, however, could be termed "false security," she noted, for "there is a fairly large proportion of children whose diets are not well-fortified by certain nutrients."

According to analysis of finger-tip blood samples, vitamin C nutrition was found to be less than optimum for many children and actually poor for approximately one-fourth, she specified. A lack of carotene-rich fruits and vegetables in the diets of many children also produced results evident on analysis of blood samples.

## Teen-Age Girls

Most conspicuous for poor diets were the teen-age girls, Eppright emphasized. More than half had diets which appeared to be grossly inadequate. She pointed out that this is a particularly critical group since it concerns the well-being of the future generation.

Among the teen-agers, overweight girls were conspicuous for their poor diets, she said, suggesting that concern about overweight should focus attention on the inadequately nourished, overweight teen-ager.

Concerning physical development, Eppright reported that the children appear to be growing satisfactorily according to standards of physical fitness. Children with liberal diets tend to be slightly taller, heavier, and larger in leg girth than children whose diets are somewhat below the recommended dietary allowances, she noted.

The study, she said, has pointed to the importance of keeping systematic records of height and weight of children. She recommended that schools follow such a procedure as part of their school health program.

The most conspicuous physical defect found on clinical and dental examination, she added, was poor teeth. More information is needed about the impact of the nutrition of children on the condition of their teeth, she declared.



# Use of Exhibits, Publications . . .

*Prenatal pamphlets, workable "suitcase" exhibits for children, modern format for medical and public health publications, and the need for coordinated efforts of various agencies in health education programs are discussed.*

## Prenatal Pamphlet Series May Benefit Mothers

A series of prenatal pamphlets was found in a recent study in New Orleans, La., to have some effect on the knowledge and attitudes of expectant mothers, according to Loyd W. Rowland, Ph.D., director, Louisiana Association for Mental Health, and Joseph F. Follettie, M.S., lecturer in social research, Tulane University Graduate School of Social Work.

This conclusion was based on the responses of 51 mothers who had received the series and a control group of 95 mothers to 55 questions relating directly to the series materials. The showing made by the two groups favored the experimental group for 39 questions and the control group for 15, they stated, pointing out that the difference between 39 and the number of questions for which the responses would be expected to favor each group, 27, is significant at the 0.001 level. Only 2 of the questions, taken individually, showed a statistically significant difference at the 0.05 level, they added.

They reported that the two groups were selected from among 436 mothers who had had first babies in private hospitals in the city during a 2-month period. The groups were fairly well equated as to amount of reading other than the series materials, employment of the father, and income, they said.

They suggested, however, that the following procedures might yield a more definitive study of the prenatal materials: interviewing the mothers immediately before the birth of their

child; selecting experimental and control groups from the same statistical universe; selecting sample groups racially and socioeconomically representative of the statistical universe from which they are drawn; and using professional interviewers.

Concerning the first suggestion, Rowland and Follettie pointed out that the interval of time transpiring between the birth of the child and the time of the study may have decreased the chances of getting favorable results. There is a medical tradition that regardless of anxieties beforehand and the unpleasantness of the birth process there is a conscious effort on the part of the mother to forget all of it, they explained.

### Acceptance by Authorities

Noting the difficulty of measuring knowledge of learned material and the even greater difficulty of measuring attitudes, Rowland and Follettie suggested two criteria that they believe are fairly reliable for judging educational materials: the acceptance of the material by authorities in the field and the popularity of the material with those expected to use it.

Applying the first of these criteria to the prenatal pamphlets, Rowland and Follettie asked 100 physicians who distributed the materials to their patients for their opinion of the materials. Forty-five responded, all favorably, the responses ranging from a simple "good" or "continue" to lengthy commendations, they said.

Efforts to determine the effectiveness of what is being done in the

health education field should not be relaxed, they declared. Each evaluation study, they said, helps to develop standards and thus benefits the whole health education movement.

## Modern Formats Attract Responsive Readers

Pamphlets and magazines which aim to inform busy members of the medical and public health professions should be as smartly designed, as well written, and as attractively illustrated as the sales pamphlets, literary and picture magazines, and other printed matter which compete for attention. Publication figures and reader surveys confirm this, according to Russell W. Cumley, Ph.D., director of publications at the University of Texas M. D. Anderson Hospital and Tumor Institute, and executive editor of *The Cancer Bulletin*.

A dynamically designed and illustrated pharmaceutical publication stimulated an unprecedented increase in sales of the manufacturer's products, he said of a journal with which he was previously associated. Accordingly, it was decided to publish *The Cancer Bulletin* in contemporary format, assuming that this would attract more readers.

Originally distributed to 7,500 Texas physicians, within one year the circulation jumped to 100,000, as requests for copies were received from physicians and cancer control agencies in other parts of the United States and in many foreign countries, Cumley stated. Regional reader surveys indicated that 50 to 90 percent responded, an extremely high percentage. Nearly 90 percent of the responding physicians indicated that the periodical aided them in their practice.

Articles usually have a large and provocative illustration on the first page, Cumley said. This draws attention to the title. Primarily designed to induce further reading,

the title does not necessarily indicate the content of the article. A subtitle takes over this function. If no subtitle is used, the title itself must fill this need and lead the reader to the first paragraph. This paragraph presents the general substance of the article and should assure that continued reading will be beneficial. The remainder of the article proceeds swiftly to present its case with as few words as possible.

Journalistic presentation throughout does not compromise scientific integrity and, when the last paragraph is reached, Cumley stressed that the reader should be left with a feeling that he has benefited by the reading.

## Health Museum Designs

### 3-D Suitcase Exhibits

Suitcase exhibits with three-dimensional models are being used in the health education area served by the Cleveland Health Museum, Cleveland, Ohio. Unique in school health education, and still experimental, the series is proving to be a fascinating and practical way of having children visualize health concepts, according to the museum's curator of education, Winfield G. Doyle, Ed.D.

Children like exhibits they can work themselves, Doyle said. A child can touch and work any of the 14 exhibits in the museum's current series on good health habits and the science of the body. The exhibits were displayed at the annual APHA meeting.

The series has been developed for classroom use at many grade levels. Although designed originally to meet local needs, it can be expanded to include more specialized topics. Standard-sized suitcases hold most of the exhibits. Few weigh more than 50 pounds apiece. All come equipped with leather carrying handles. None is too big for a teacher to handle. All displays are large enough to be seen in the average classroom.

Instruction aids, such as charts

and diagrams, are part of the exhibits. A master magnetic tape has been prepared for each suitcase, describing the exhibit in detail, and giving teachers pointers on what to stress at different grade levels as well as suggestions for coordinating class projects. The teacher can review the subject matter on the tape before taking the exhibit into the classroom.

### *The Visual Appeal*

Some of the exhibits are designed for the youngest pupil to understand, Doyle said. Captions are simple and interest-provoking. All exhibits use cheerful color combinations. Children are given a chance to eat unfamiliar foods and to correct poor eating habits at "tasting parties," in connection with one exhibit, "Foods Can Be Fun."

Some of the exhibits rely on swinging or removable panels to unfold a complex idea or to highlight the difference between desirable and undesirable habits. "Rest and Sleep" uses a window shade to suggest the familiar act of pulling down the shade in a child's bedroom before he retires.

Some of the models of the organs of the body are completely dissectible. The ear model in "How We Hear" comes apart so that it can be used for discussion of the structure of the outer, middle, and inner ears.

When a button is pushed in the posture exhibit "Straight and Tall," a boy standing straight like an "I" slumps into curves like an "S." The exhibit "Teeth Are To Keep" has models of a molar, an articulated denture, and a few common dental instruments, such as a mouth mirror and saliva extractor.

The eye and ear exhibits also aid the school or public health nurse in her screening and testing. In "Why We Need Glasses," nearsightedness, farsightedness, astigmatism, and double vision are shown. Diagrams showing these defects are on one panel, while on the right, the same scene has been photographed as it would appear to persons having these defects. Plastic slides hang on pins over the eyeballs to show

how the defects are corrected with lenses. A dissectible eyeball is included along with a Snellen chart, a series of color cards for testing color vision, and a near-vision chart.

## Health Education Programs Need Coordinated Effort

All persons in the education, public health, and welfare fields must work together if health education programs are to be complete, declared Dora A. Hicks, Ed.D., chairman, professional health education, University of Florida. Cooperative and coordinated planning techniques are needed to prevent duplication of some procedures that are necessary to solve the health problems of students and to avoid omission of others, she said.

A technique for evaluating school health programs which will eliminate subjective judgment as far as possible and will show results of health education in terms of actions and accomplishments has been needed for some time, Hicks continued. Periodic systematic examination of health programs will yield information that will be helpful in future planning, she stated.

Hicks described the development of a technique for self-evaluation of the entire school health program. This technique, she said, is apparently more objective and more adequate than any that has been reported so far and should serve as a guide for evaluating any school health program. Development of the technique included a review of the literature; establishment of a list of accepted standards, policies, and procedures for adequate school health programs; construction of a survey form; and preparation, comparison, and evaluation of the data.

### *Sources of Standards*

A number of sources related to school and community health were consulted in developing the evaluation technique, Hicks said. Among these were reports and studies by

professional organizations; surveys of health practices; studies on legislation and State regulations; health education textbooks; group reports and studies on special problems, such as organization, administration, and supervision; and conference reports.

Hicks stated that a full report of the development and application of the self-evaluation technique of school health programs and the results obtained is contained in an unpublished study, "Evaluation of an Inservice Program for Improvement of School Health Education."

Under carefully controlled conditions, this mixture was divided into samples in test tubes, quick frozen, and after packing in dry ice, was sent to the pilot laboratories. At a given time the next day, when all samples could be presumed to have been delivered, a standard plate count was performed adhering to the Standard Methods for the Examination of Dairy Products with one exception, they related.

Results on the first 50 split milk samples, they reported, were as follows: Laboratory A agreed within 10 percent with the control laboratory on 81 percent of 31 specimens tested; laboratory B, on 64 percent of 50 specimens tested; laboratory C, on 70 percent of 50 specimens tested. These laboratories could reproduce the results of the control laboratory within 10 percent 73 percent of the time, within 15 percent, 83 percent of the time, and within 20 percent, 93 percent of the time on the average.

Tests with a second group of 25 split milk samples did not yield any greatly improved results, although modifications to improve the agreement between laboratories were made, they reported.

## Food and Beverage Council Objectives Explained

Existing ordinances and codes governing sanitation requirements in public and private eating establishments should be reevaluated in the light of present-day conditions and new knowledge, stated Henry F. Vaughan, Dr.P.H., dean, University of Michigan School of Public Health, and president, National Sanitation Foundation, in discussing the food protection program of the National Food and Beverage Council.

The National Food and Beverage Council was organized in 1953, Vaughan reported, under the joint auspices of the National Restaurant Association, the American Hotel Association, the Public Health Service, the National Sanitation

# Food and Milk Sanitation . . .

*Although progress was reported in restaurant sanitation, there remains a job to be done, especially in educating restaurant workers. Take-out foods are receiving increased attention. Improvements in milk sanitation equipment and methods were discussed and Missouri reported on its experience with an approval program for local milk laboratories.*

## Local Milk Laboratory Approval Program

Experience in trying to organize a local milk laboratory approval program in Missouri has shown that a 20-percent deviation from the State laboratory findings would be a practical standard, according to Irma C. Adams, B.S., director, bureau of laboratories, and William J. Beck, M.S., bacteriologist, Missouri Department of Public Health and Welfare.

The organization of the approval program included development of a method for performance of tests on split milk samples by the local and State laboratories for control purposes, they related. It was found that the standard of agreement—within 10 percent deviation—between State and local laboratories, as had been previously suggested, would be impossible at this time for the laboratories in Missouri, they declared.

### Program Preparation

The first step taken to develop the Missouri approval program was to

give a series of workshops on the actual techniques and tests performed, they related. As it was impossible for all the technicians to attend the workshops in 1950 and 1951, during 1952 and 1953 local laboratories were visited by State laboratory personnel and surveyed, using the Public Health Service form, on equipment and methodology, they explained.

This second step revealed that only 10 of 22 laboratories visited had satisfactory compliance. The largest deviations found through the survey forms, next to keeping records, were in the apparatus used, plating techniques, and variations of incubation temperatures, they reported.

### Split Milk Samples

The third step in the laboratory approval program was the development of a plan for utilizing split milk samples, Adams and Beck reported. Two or three of a given amount of known organisms, *Escherichia coli*, *Micrococcus pyogenes aureus*, *Streptococcus liquefaciens*, and *Sarcina lutea*, were added to cold sterile skim milk, they said.

Foundation, and State and local health services. The council's purpose is "to encourage people to know the value of and to demand quality food, well prepared, served in a clean and sanitary manner in clean, pleasant surroundings, whether at home or any other place where food and beverages are served," he said.

## *Sanitation Pattern*

Vaughan summarized the council's activities as follows:

1. Developing of voluntary and coordinated leadership among health authorities, industry representatives, other groups, and individual citizens.
2. Obtaining endorsement and support from food and beverage associations, individual companies, and members of the public.
3. Developing educational material and instruction aids to be used at all educational levels.
4. Forming a permanent staff to launch and keep the program going in all of its phases.
5. Establishing pilot programs in representative communities and working out details of activating communitywide educational programs with State and local leadership.

Vaughan suggested the issuance of a guide or manual which would combine the best features of existing food and beverage service regulations and provide a uniform sanitation code for communities and industry to follow. He felt such a manual should be prepared through the joint efforts of the leading food and beverage industries and Federal and local public health organizations. Continued research, he said, should provide up-to-date technical data to keep the food protection program effective and nationally acceptable.

## **Notes Equipment Advances In the Dairy Industry**

Reviewing methods and equipment which have been introduced into the dairy industry during the

past 10 to 15 years, H. L. Thomasson, executive secretary for the International Association of Milk and Food Sanitarians, Inc., named the bulk farm cooling tank as probably one of the outstanding developments.

Significant features of the bulk farm cooling tank, Thomasson noted, are fast cooling, ease of cleaning, elimination of the use of heavy cans, and minimum exposure of the milk to contamination. The use of this tank also eliminates the need for can washers in the pasteurization plant and for the handling of empty return cans, he said.

Other developments that Thomasson considered noteworthy include the following: the farm tank pickup truck; cleaned-in-place pipelines; bulk milk dispensers; improvement of dairy herds through artificial insemination; the Ring test for brucellosis; vacuators; high-temperature, short-time, continuous flow pasteurizers; automatic feeders for the addition of vitamins; improved cleaning compounds; the formation of the 3A sanitary standards group; and the use of paper containers in the distribution of milk.

Although bulk milk dispensing is not new, this type of milk distribution has been greatly improved, Thomasson specified. Pointing out that the filling of cans at the pasteurization plant has been one of the knottiest of sanitation problems, he reported the recent development of an automatic can filler that operates in the same manner as a glass bottle filler and thus eliminates the need for filling cans manually.

## *New Fortification Method*

Thomasson also reported that a new method has been devised for continuous flow fortification of milk with vitamin additives. The device is the first with design and operating principles acceptable to sanitarians, he stated. He explained that with batch fortification, the sanitarian has little opportunity to check the actual performance of fortification unless he happens to be present during the process. With the new

method, the sanitarian has an opportunity to see whether fortification is being done in the proper manner since the unit operates continuously during pasteurization.

The 3A sanitary standards group, formed in 1941, is helping to eliminate what once was a major problem in the dairy industry, that is, the necessity for manufacturing equipment to meet a variety of health requirements, Thomasson indicated. This group, composed of 3 committees representing various organizations, has established 16 standards and 3 revisions covering types of materials, finish, fabrication, construction, and other design features for various kinds of equipment, he stated. Although progress is sometimes slow, eventually all dairy equipment will be covered by the standards, he declared.

Remarking that research on methods and equipment is going on all the time, Thomasson mentioned sonic pasteurization (destroying bacteria by sound waves) and radiation sterilization (sterilization by light waves, infrared, or similar means) as among the areas being studied today.

## **Sanitation Problem Seen In Take-Out Foods**

Serve-yourself freezers and rotisseries provide marketing conveniences but pose another problem—that of sanitation of take-out foods, according to one report.

The report was made by Charles L. Senn, director of the sanitation bureau of the Los Angeles City Health Department, and Col. Paul P. Logan, director of research, National Restaurant Association. They are cochairmen of the Committee on Research of the National Food and Beverage Council.

The extent of the problem can be seen, Senn and Logan said, by the production of frozen pies which in 2 years has accelerated ten times to 250 million units in 1954. Another

factor is the increase in number of restaurants which have factories for the production of take-out foods which are becoming ever more popular with the industrial worker.

Although local health departments devote much time to restaurant and food processing sanitation, there is need for a similar amount of time and effort to be given to the supervision of "take-out" foods operations, Senn and Logau said.

Other points of their discussion of the problem included the following:

The frozen food industry must recognize certain dangers and be on guard against them. Among these are: various paratyphoid organisms in eviscerated poultry; paratyphoid and typhoid bacilli surviving for long periods of time in frozen foods; the botulism organism and its toxin which remain potent after prolonged freezing.

In some plants, as many as 25 pairs of hands work over take-out chicken pies, as the ingredients move along the assembly line.

Field inspections showed that the poultry and other raw ingredients were of reasonably good grade, but there were no official, routine inspections at some plants.

High standards can be reached. One study with cold and hot packed samples showed that the product packed hot was practically sterile, they said, while the cold products averaged 4,000 to 6,000 organisms per gram on bacteria plate counts.

Proper packaging, clear labeling, and public education can help solve the consumer's problems. No matter how sanitary the product is, it can become spoiled if kept too long at room temperature.

The Los Angeles area has improved sanitation factors in the industrial catering business. New regulations permit handling hot foods on a trial basis, provided hot foods not sold on the first day are discarded.

Rules for the installation and operation of rotisseries afford reasonable control up to the time the food is sold.

## Water Pollution Control . . .

*Topics included in this section are tests to detect water pollution and to trace infectious agents, the plentiful use of water as a shigellosis preventive, the Southwest's water supply shortage, and sewage management.*

### Plentiful Water Supply May Reduce Shigellosis

Lack of water for personal hygiene and laundry may be a significant factor in the prevalence of *Shigella* infections, according to the findings of 1952-53 studies among residents of migratory farm labor camps in Fresno County, Calif.

The study was reported by A. C. Hollister, Jr., M.D., M. D. Beck, M.A., A. M. Gittelsohn, M.P.H., and E. C. Hemphill, M.P.H. They said there were no other environmental factors to explain the association between availability of water and the number of *Shigella* infections found in these camps.

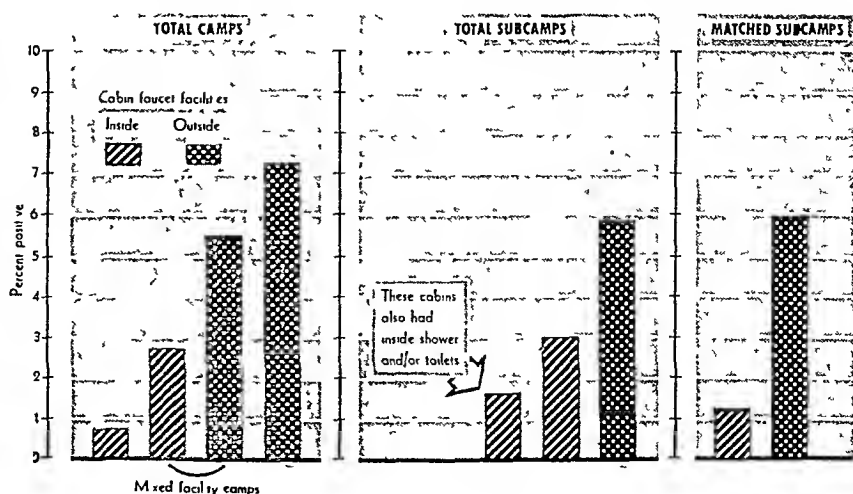
Dr. Hollister is chief and Mr. Beck and Mr. Gittelsohn are with the bureau of acute communicable diseases, California State Department of Public Health. Mr. Hemphill is with the Epidemiology

Branch, Communicable Disease Center, Public Health Service.

Hollister and his co-workers reported that in the 70 camps studied during a 7-month period, the proportion of persons with positive *Shigella* cultures varied inversely with the availability of water. In camps in which all cabins had either private or inside water faucets, 0.7 percent of the cultures from individuals were positive. However, in camps in which none of the cabins had inside water faucets, the rate was 7.2 percent positive.

The investigators said that the rate of prevalence of *Shigella* infections ranged from 1.6 percent in cabins with complete inside plumbing to 5.8 percent in cabins which had no inside plumbing. Among the cabins which had inside water faucets only, with other facilities outside and available for communal use, 3.0 percent of the cultures were positive, they said.

Shigella positivity rates, by water availability.



Results of a study of the relationship between prevalence rates of *Shigella* infections and the amount of water available for personal hygiene in southern Georgia confirm the findings of the Fresno County investigators, Hollister and his co-workers stated.

## Environmental Control

The findings of the California and Georgia studies indicate that when water is used for washing and bathing, it can aid in the reduction of intestinal infections, acting as a diluent instead of as a vehicle for the transmission of pathogenic organisms, they continued. The implication is that the relatively inexpensive provision of plentiful and easily accessible supplies of water will bring about significant improvements in the control of *Shigella* infections.

Hollister and his co-workers said that these studies are the first organized efforts "to isolate some of the elements of environmental sanitation and personal hygiene practice and to begin to evaluate them in order of preventive importance for a particular disease entity," and that "only by defining such fundamentals can programs for improving the health status of depressed populations anywhere be brought to maximum efficiency."

In conclusion, they said that this hypothesis must be subjected to critical tests in the field, possibly in several situations in various parts of the world, and suggested that it might be desirable to include other diseases than shigellosis in these tests.

## Trace Infectious Agents By Sewage Sampling

Results of three projects illustrate the suitability of the swab technique for sampling sewage and, in combination with appropriate isolation methods, for isolating infectious agents which may occur intermit-

tently in sewage, according to Sally M. Kelly, Ph.D., Mary E. Clark, and Marion B. Coleman, division of laboratories and research, New York State Department of Health.

The swab technique, as suggested by British workers, offers a practical approach to the problem of searching for *Salmonella* carriers among groups of food handlers, they declared. The ease and safety with which the swabs may be handled cannot be ignored, they added.

## *Salmonella Typhosa*

After the occurrence of a third case of typhoid fever in the vicinity of a stream into which the effluent of a town's sewage treatment plant was discharged, they related, a search for the carrier of typhoid bacilli, phage type D<sub>4</sub>, was instituted.

Strips of gauze, 6 by 48 inches, were folded to make swabs and sterilized, then immersed in sewage at points which covered a specific street, they reported. After 4 days' immersion the swabs were removed and each swab was placed in glycerol solution and received at the laboratory within 24 hours, they said.

*Salmonella typhosa* was isolated from 10 of 29 specimens, including one from the sewage drainpipe of a nursing home, but not above this point in the sewerage system. The carrier was discovered in the nursing home, they reported.

## *Coxsackie Viruses*

A study of the distribution of Coxsackie viruses in sewage, using the catch and swab sampling methods, showed that the swabs yielded viruses more consistently than the samples taken by the catch method, they reported, and that:

Coxsackie viruses are found in sewage from June through November, the peak occurring in late July and early September. The viruses were recovered in 7 of 9 sewage plants examined "in season." During December through May, the viruses are found only sporadically, if at all. The viruses are not destroyed by sewage treatment, in par-

ticular, by Imhoff tank sedimentation and certain phases of secondary treatment. The viruses occur intermittently during the daily flow, and more than one serologic type may be present in a sample.

## *Tubercle Bacilli*

Specimens from the sewage of two treatment plants which serve large tuberculosis hospitals were examined to determine the effect on tubercle bacilli of primary and also secondary treatment, consisting of trickling filter clarification followed by chlorination, they stated. The findings show a decrease in the number of tubercle bacilli by both methods of sewage treatment, they reported, but neither method is entirely effective.

## Tests Favor Enterococci As Pollution Signals

Reconsideration of the use of the enterococcus group of bacteria as indicators of sewage polluted water is advocated by Warren Litsky, Ph.D., and W. L. Mallmann, Ph.D., as a result of a 2-year study of Connecticut River samples.

Dr. Litsky, associate research professor, University of Massachusetts, and Dr. Mallmann, professor at Michigan State College, found an enterococcus density approximately 7.6 times that of *Escherichia coli*, the organism commonly used to indicate water pollution. In a statistical analysis of the bacteria determinations, they demonstrated a definite relationship between the two types of organisms. The increase in the *E. coli* index, they said, was generally followed by a predictable increase in the enterococcus index.

During the 2-year period, water samples were collected at least twice monthly from 14 stations in areas of both low and high pollution along the Connecticut River in the vicinity of Northampton, Mass. The 7.6 to 1 ratio of enterococci to *E. coli*, the highest reported ratio thus far, is



based on the median value of all samples collected in the study.

This finding, Litsky and Mallmann said, "suggests that the enterococcus organisms be taken out of the realm of stepchildren and given their legitimate place in the field of sanitary bacteriology as indicators of sewage pollution." They pointed out that enterococci have been found to be abundant in fecal matter, but, unlike the coliform bacteria, they have not been found anywhere in nature.

### *Superior Medium*

They attributed their results to the use of a superior medium for detecting and enumerating enterococcus organisms. Azide dextrose broth (Difco) was used as a presumptive test for the enterococci and ethyl violet azide broth as a confirmatory medium.

The low numbers of enterococci recovered from sewage and polluted water in several previous investigations, they believe, was due to the failure of the media employed for their isolation and not to the low numbers of the organisms. Cited as an example was the 63 to 1 ratio of *E. coli* to enterococci reported by Lattanzi and Mood in a 1951 study of water samples taken from the harbor at New Haven, Conn. The Winter and Sandholzer technique was used on the harbor water samples.

Leading to a review of the coliform-enterococcus ratio in sewage polluted water, they related, was the earlier demonstration by Mallmann and Seligmann that azide dextrose broth was far superior to other media for the detection of streptococci in water and sewage. Using this medium, Mallmann and Litsky recovered about the same number of coliform bacteria and enterococci (intestinal streptococci) from soil freshly treated with sewage.

Because the azide dextrose broth supported the growth of a few other nonstreptococcal forms, Litsky, Mallmann, and Fifield developed ethyl violet azide broth as a confirmatory medium. The presumptive and confirmatory media, it was re-

ported, detected 100 to 10,000 more enterococci in polluted water than were detected by other methods.

Litsky and Mallmann concluded that more work must be done along this line if the isolation and detection of enterococci is to become a method useful in sanitary bacteriology.

### **Limited Use Credited To Ultraviolet Purifier**

In the event of an emergency involving failure of municipal supplies, naturally contaminated water can be made safe for human consumption by the use of an individual ultraviolet purifier.

Such an apparatus was described and results of the first systematic study on factors influencing the ability of ultraviolet radiation to kill bacteria were presented in a report made by the following: H. C. Ricks, M.D., M.P.H., director of laboratories, T. D. Labecki, M.D., medical consultant, F. J. Underwood, executive secretary, and G. R. Reeves, senior bacteriologist, Mississippi State Board of Health, Jackson, Miss.; and J. R. Cortelyou, Ph.D., chairman, department of biological sciences, M. A. McWhinnie, M.D., associate professor of biology, and J. E. Semrad, Ph.D., professor of biology, DePaul University, Chicago.

The purifier is particularly useful in areas where it is difficult to solve problems of water supply by sanitation and engineering measures. With an adapter and a standard automobile electrical system, it can also be used to purify water during camping, hunting, and fishing trips, and in areas where drinking water is unsafe.

### *Radiation Intensity*

Although the purifier has certain definite limitations, these are clearly stated and are provided for in the apparatus. The report said that even heavily contaminated water can

be safely purified by this means, provided that adequate intensity of radiation is established and maintained. This will depend on several factors: number of hours the lamp used has been burned; maintenance of proper line voltage and water temperature; effect of mineral and organic content of the water on transmission of radiation; differences in the resistance of various bacterial species to ultraviolet radiation; duration of exposure of all particles of water to the germicidal energy of the ultraviolet rays; and observance of certain precautions by operators of the apparatus.

Results of laboratory and field tests refute statements that various circumstances may make it impractical to purify water by ultraviolet radiation, Ricks and his associates reported. Apparently proper design of the purifier will compensate for these limiting factors.

They warned, however, that purification of contaminated water on an individual consumer basis should not be allowed to replace sound public health measures for the provision of safe public water supplies and that the purifier should not be considered a replacement for efforts to improve individual sources of water.

### **Urges Sanitation Studies In Hepatitis Research**

The actual number of cases of infectious hepatitis resulting from waterborne virus is undoubtedly much greater than the number reported, according to C. H. Connell, Ph.D., professor of sanitation, department of preventive medicine and public health, University of Texas School of Medicine, Galveston.

More precise recognition of the disease and better reporting of cases is one of the prerequisites for adequate epidemiological studies of this disease, he asserted. A second prerequisite, he said, is the development of methods for titrating the virus other than by use of human volunteers.

The epidemiologist should take the lead and, with other members of the health team, obtain a better evaluation of environmental factors important in transmitting the disease, he declared.

## Needed Research

In the field of water and sewage purification, Council asserted, the following research investigations are needed:

Measurement for effectiveness in removing and inactivating hepatitis virus under conditions approximating those of plant-scale operation of water treatment processes, coagulation, sedimentation, filtration, and chlorination; evaluation of the effect of pH upon those processes; and a more precise evaluation of the effects of chlorine, particularly when free chlorine alone is present; a similar comprehensive study of the effectiveness of sewage treatment processes; and an evaluation of bacteriological coliform test as an index of fecal contamination in relation to the presence or absence of hepatitis virus in water.

## Septic Tank Failures Cause Concern

Outlining the tentative recommendations of the APHA Committee on Rural Sanitation, its chairman, John E. Kiker, M.C.E., professor of civil engineering, University of Florida, asserted, "Septic tanks and subsurface sewage disposal systems are poor substitutes for central collection systems and treatment facilities."

There is no substitute for the application of basic engineering principles in the proper design of subsurface sewage disposal systems, he added. As a result of many failures, which may be attributed to a disregard of these principles, septic tanks have fallen into disrepute in recent years.

Most of the septic tank failures have occurred in suburban areas

where public sewerage facilities should have been required, he noted. Unfortunately, Kiker commented, few health departments have the authority to require such facilities where they are needed, and it is doubtful whether the number of sewerage systems will ever be enough to supply the needs.

The nuisances caused by overflowing sewage at private dwellings are found mainly at project subdivisions and could be prevented by proper planning and enforcement of regulations, he stated.

As two-thirds of the houses being built are in suburbs not served by public sewers, the Nation faces the problem of making the best of a bad situation for years to come, he said. Sewage overflows will probably continue to be the most common public health nuisance, but it will be possible to minimize such nuisances through the exercise of judgment and adherence to basic engineering principles, he commented.

## Use of Septic Tanks

In general, Kiker said, septic tanks should be used only in rural areas of large acreage where suitable soil for disposal of the effluent is available. The tanks should not be used where the soil is impervious, where the ground water table comes within 4 feet of the surface during the wettest season, where the subsoil is otherwise unsatisfactory, or where there is any likelihood of contaminating a body of water.

All subsurface disposal systems, he continued, should be designed on the basis of percolation tests made in the soil after thorough saturation. In the case of shallow devices for sewage disposal, the soil characteristics for a depth of at least 5 or 10 feet should be determined. Underground characteristics and percolation tests should be correlated in estimating the probable life of a subsurface disposal system, he said.

Kiker outlined preliminary considerations in designing septic tanks and subsurface sewage disposal systems: percolation tests, estimates of

sewage quantities, area and distance requirements. He also cited 18 standards which have been successful in some places.

The reporting committee was composed of A. N. Best, Robert N. Clark, William T. Ingram, Robert W. Lambertson, Louva G. Lenert, Harvey F. Ludwig, Joseph A. Salvato, Jr., James R. Simpson, and Samuel R. Weibel.

## Southwest's Water Supply Problems Are Increasing

By the year 2,000, nearly three times as much water will be needed in the Arkansas-White-Red River Basins as is needed today. These potential water supply requirements, especially for industry and municipal use, will present a problem to all public health agencies, particularly State health departments, stated E. C. Warkentin, B.S., M.P.H., E. P. Sellner, M.S., and H. W. Poston, B.S.

Mr. Warkentin is officer in charge and Mr. Poston is assistant basin engineer, Lower Mississippi and Western Gulf Drainage Basins Office, Public Health Service, Little Rock, Ark.; Mr. Sellner is the Public Health Service representative on the Domestic and Industrial Water Supply Group.

## Surface and Ground Waters

Surface water problems vary in the three river basins, Warkentin and his colleagues said. In the western half of the area, rainfall is low most of the year, and at times, water may be unsatisfactory or even unusable. In the eastern half, most of the streams have a continuous flow, but during dry periods, the smallest streams cannot be depended upon unless the water is impounded.

Natural salinity and disposal of industrial wastes and municipal sewage affect the chemical quality of the water, and storage reservoirs in the Arkansas and Red River Basins must have a large capacity to allow for the accumulation of sediment.

The quality, quantity, availability,



and suitability for domestic and industrial uses of ground water vary with the character and productivity of the ground water provinces traversed by the major rivers in the basins, Warkentin and his co-workers said.

Oil brine has damaged ground water in some areas; in others, natural pollutants have resulted in poor quality of water. In rural communities, water in more than half the wells is unsafe for human consumption, and in some areas, no water is available and supplies must be hauled in.

Warkentin and his colleagues recommended further investigation of the feasibility of replenishing ground water supplies in areas where they have been depleted by intensive irrigation of rice.

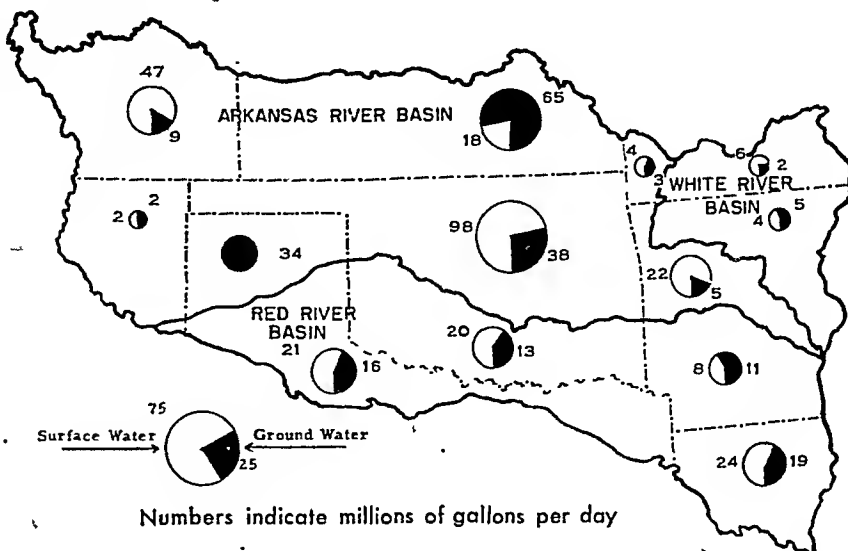
### Possible Solutions

Some industries and municipalities can increase existing sources of water supply; several multiple-purpose reservoirs in the basins have storage capacity or maintain a low flow of water for pollution abatement and water supply; 11 reservoirs have been authorized or are recommended for Federal construction; and legislative authority has been given to modify some reservoirs, provided certain conditions are met by States, municipalities, and local agencies, Warkentin and his co-workers reported.

They said that 40 reservoir projects with a total storage capacity of more than a million acre-feet, which could be used by 75 or more communities, are apparently economically feasible in this area, that hydroelectric storage power would amount to 1,726,000 acre-feet, and that water releases from power production could be used for water supply purposes.

They also stated that water from a sparsely settled area in the Red River Basin which has an abundant supply of excellent quality water from the combined flow of four rivers may eventually be pumped as far as 150 miles from its source.

**Municipal water use from ground and surface sources in the Arkansas-White-Red River Basins, by State sections of drainage basins.**



Warkentin and his colleagues said that the States in the Arkansas, White, and Red River Basins and the Arkansas-White-Red River Inter-Agency Committee have been studying the problems of water resources

and supplies in this area since 1950. The committee's report and plan for the development of water and land resources in these river basins is to be presented to the Congress on June 30, 1955.

## School Health Practices . . .

*Rochester, N. Y., finds no special case-finding value in the school medical examination of first grade children who had been examined a year before, and Stanford University finds no special benefit in separate classes for the child who has had rheumatic fever. Minnesota University's unusual health service has been designated a local health unit.*

### New York Studies Role Of School Medical Exams

A study in Rochester, New York, has found that a school medical examination of first grade children who have been examined in kindergarten is valueless from a case-finding standpoint, according to a report by Alfred Yankauer, M.D.,

M.P.H., and Ruth A. Lawrence, M.D.

Dr. Yankauer is director, bureau of maternal and child health, New York State Department of Health, and Dr. Lawrence is pediatrician, Rochester Health Bureau, and instructor, University of Rochester School of Medicine and Dentistry.

Of 997 previously examined children, 210 had adverse conditions,

they specified, but 164 of these were already under medical care and 25 were already known by the school health service to have the adverse condition.

Of the remaining 21 children, only 1 had a serious condition which had developed since the previous examination and which could not have been observed by a classroom teacher, they noted. This child had epileptic seizures which occurred only at night. Two other children of the 21 had Baker's cyst of the knee.

These data were obtained, Yankauer and Lawrence explained, from the first of four examinations that have been or will be made each year on the same children. In addition, each year after the first, a control group of children at the same grade level but in other schools will be examined. The prevalence data from the first examination serve primarily to provide a baseline for analysis of future findings, they pointed out.

To define more accurately the role of periodic medical examinations in the school health program and to clarify the role of the school physician were given as objectives of this 4-year study. It will explore some of the following questions, Yankauer and Lawrence said:

Are the traditional purposes of a periodic medical examination (to detect adverse conditions, to advise concerning the need for care, and to educate parent and child) realistic today? How necessary is periodic examination of the entire school population for detecting adverse conditions? How frequently should medical examinations be performed to achieve their stated purposes? What is the annual increment of adverse conditions detectable only by medical examination? How many conditions detected by the medical school examination are already under care?

### *Study Methods*

Medical examinations performed for this study consisted of a com-

plete and careful medical history and a physical examination of all systems, they specified. Included in the report, however, were data only on conditions the detection of which requires the skill of a physician. Tests for visual acuity and hearing loss and other laboratory screening tests, such as urinalysis and tuberculin tests, were not performed.

The study group for the first examination was composed of 1,056 first grade children (including 59 not previously examined), 97 percent of the 1952-53 first grade population of 13 schools in Rochester, N. Y., they stated. From each of three socioeconomic groups of schools, four or more were selected so that the first grade population in each group would represent a 15-percent sample of the total first grade population of that group.

## **No Advantages Shown in Health Class Study**

The post-rheumatic fever child benefits no more from special health classes than from regular classes, Raymond George Nebelung, Dr.P.H., Ed.D., department of public health and preventive medicine, Stanford University School of Medicine, maintained in describing a 2-year study made of 444 such children in San Francisco.

To determine the value of special education over regular school routine, the study grouped the children in two sections: (1) health classes with a curtailed school and activity program; and (2) regular classes with the normal type of school activities.

Features of the special health classes included special teacher training in education of the handicapped child, small classes, modified teaching program, shorter school day, scheduled rest periods, and a supplementary nutrition program. In the regular classes no restrictions were put on the post-rheumatic child's activities, Nebelung said.

Cardiac classification categories were set up for the two types of classes, using for each child the original and current classification data from the cardiac registry of the San Francisco Board of Health. No case was selected for the study until at least 1 year had elapsed following the child's illness. The physician's physical finding on examination of each child determined the child's classification.

The data for the two groups were compiled in terms of retrogression, no change, or improvement in the child's condition. Analyses of the data showed no significant differences in degree of improvement existing between the members of the health classes and the regular classes for the various years studied, Nebelung stated.

However, supervision of the physical activities of the post-rheumatic fever child is essential, Nebelung stressed. The child must be taught to recognize his own capacities and to conserve his energy while the damaged heart muscle is repairing. The question becomes one of types and amount of exercise in which the child should be encouraged to participate. But, at present, no specific technique is available to measure accurately the functional capacity of the heart.

Nebelung urged both physical educators and physicians to strive for improved techniques for classifying post-rheumatic heart cases.

## **Air Disinfection Reduces Bacteria, Not Illness**

Even children who live in isolated rural areas and spend most of their day at school experience sufficient extracurricular contacts with bacteria and viruses to outweigh any benefit from a substantial bacterial count reduction in the air of their schoolrooms and school buses, according to the results of a 9-year air disinfection study of 4 schools in upstate New York.

The report, fourth in a series, is a résumé of bacteriological investi-

gation since 1945, two members of the New York State Department of Health reported. They are F. Wellington Gilcreas, assistant director in charge of laboratories for sanitary and analytical chemistry, and Hazel R. Read, division of laboratories and research.

Comparative studies of treated rooms and untreated control areas, they said, show that both ultraviolet light and triethylene glycol vapor reduce the number of bacteria in schoolrooms, but that the reduction has no significant effect on viruses and the incidence of measles, mumps, chickenpox, or on respiratory illness. The same results were obtained when triethylene glycol treatment was applied to school buses where 60 to 100 percent of the children were in close daily contact. No significant change in the day-to-day absentee rates resulted, they reported.

### *Contrast Shown*

Gilcreas and Read said that irradiation of rooms by ultraviolet lamps resulted in decreases of 37 percent in the total bacteria per cubic foot, 39 percent in bacteria settling per square foot per minute, and 44 percent in streptococci.

Glycol vapor, said Gilcreas and Read, was carried through the rooms with air circulated by school ventilating systems. This method achieved reductions of 60 percent in the total bacteria per cubic foot, 55 percent in the bacteria settling per square foot per minute, and only 11 percent in streptococci.

Under the conditions of their study, glycol vapor appeared to produce high reduction in the number of miscellaneous bacteria but was not as effective against streptococci as ultraviolet light.

They concluded that the hours away from school and the chance for contact transmittal of viruses and bacteria in the total environmental situation play such an important role that neither ultraviolet light nor glycol vapor can effectively reduce illness.

## **Add Sanitation Services At Minnesota University**

The environmental sanitation program of the University of Minnesota student health service functions just like a sanitation division in a local health department. This unusual student health service has been designated a local health unit by the Minnesota State Board of Health, according to Richard G. Bond, M.S., M.P.H., associate professor of the university's school of public health.

The majority of college health programs do not assume responsibility for standards of sanitation, Bond pointed out. Such programs are frequently concerned only with food services, student dwellings, garbage disposal, and the like.

Continuing his analogy, Bond, who as public health engineer heads the university's sanitation staff, said:

Minnesota's nearly 30,000 students, 3 campuses, 8,000-acre research center, 2 villages of temporary housing, airport, and other facilities make the university comparable to an average community, but with accentuated problems. These reasons and the university's academic and research activities give unusual scope to the environmental health program.

Close cooperation is maintained with other programs of the student health service and with all operating units of the university. For example, arrangements have been made so that waste lines carrying potentially hazardous wastes are tagged and plumbers are instructed not to initiate repairs without first contacting the health service.

The program expanded after World War II, when a sanitary code was adopted. The program includes the usual activities of water supply sanitation, waste disposal, plumbing, housing, food and milk sanitation, insect and rodent control, plus some very specialized areas, namely—radiological safety, industrial hygiene, and general safety. To show why these safety programs have been added, Bond cited facts:

More than 20 different university departments actively engaged in radioisotope research make area and personnel monitoring and environmental control a necessity.

The university employs a labor force of approximately 4,500 and more than 3,000 faculty members. In addition to the student body, these persons are all exposed to industrial hazards, many of which are magnified in the laboratories.

Nineteen percent of the injuries reported take place in the students' residences. Many of these can be prevented by a safety program attacking the hazards to which the students are exposed.

Other factors which increase the variety of the program, he noted, are the presence of a large medical center, the necessity for special pre-employment medical examinations and annual rechecks for all food service workers, the inclusion of programs of preventive medicine, and even the problem of stream pollution.

## **Nurse Home Visits Boost Corrective Action Rate**

New procedures in the followup of school health examinations increased by one-third the percentage of children taken to a physician for corrective action, announced William G. Mather, Ph.D., Lauris B. Whitman, Ph.D., A'Delbert P. Samson, Ph.D., and Mary E. Ayers.

Dr. Mather is professor of rural sociology, Pennsylvania State University; Dr. Whitman is director of field research, National Council of Churches; Dr. Samson is assistant professor of rural sociology, Montana State College; and Miss Ayers is a research associate, Pennsylvania Department of Health.

In 15 Pennsylvania schools using the new procedures, they reported, the corrective action rate for medical defects was 60.7 percent, whereas in 5 schools not using the procedures, the rate was 45.6 percent.

A new record card that shows at a glance the progress made and the work done by the school nurse toward securing corrective action was the basic tool in the experiment, Mather and his associates specified. By means of colored tabs across the top edge, the card shows whether or not a defect (medical or dental) exists, the number of times the school nurse has contacted the family, and whether or not the contact has resulted in corrective action.

Effects of the new procedures were determined through interviews with families of the children, they noted. Interviewing was done by public health nurses 75 to 90 days after the school health examinations. It covered 97 percent of 484 children having medical defects and 96 percent of 1,117 having dental defects.

The corrective action rate for dental defects, they said, was apparently not influenced by the new procedures. They reported rates of 59 and 60 percent, respectively, for the experimental and control schools, from which fact they concluded that the problem of dental corrective action is very different from that of medical corrective action.

## Other Significant Findings

Concerning the value of school health examinations, the study revealed the following:

1. For 46 percent of the children with medical defects and for 68 percent of the children with dental defects, the parents already knew of the defects before the school examination.

2. Of every 10 children given a medical examination, only 0.7 of a child whose parents had not known of the defect before the examination was taken to a physician.

3. Of every 10 children given a dental examination, 1.2 children whose parents had not known of the defect before the examination was taken to a dentist.

Mather and his associates tentatively concluded that the present return from routine school health examinations is not satisfactory for the

time and money spent and that the examination itself should be made more of a learning experience for both pupil and parent. They pointed out, however, that although the schools were carefully selected, they would not claim the study results to be typical of conditions in Pennsylvania.

## Socioeconomic Factors

Also investigated was the relation of specific socioeconomic factors to taking corrective action for medical

and dental defects. On the basis of the data obtained, they stated:

" . . . the chances of a child's receiving corrective action . . . are best if the parents know about the defects before the examination, if the father has a college education, if the residence of the family is urban . . . if the income of the family is \$4,000 or more a year, if the parents are relatively active . . . in school affairs . . . and if the family consists of only 1 or 2 children below the age of 18 years."

# Mental Health Studies . . .

*Data from cohort studies on first admissions to a mental hospital are interpreted and show areas of needed mental health research. The emotional tensions for which classroom teachers and situations are responsible are discussed. A plea is made for school health workers and classroom teachers to work together as an example of good mental practice to their students. Evidence is presented that one-third of the adult population is responsible for a major part of illness among adults.*

## Finds One-third of Group Have Most Illnesses

Supporting evidence for the thesis that a small proportion of the adult population is responsible for a large part of all the illness among adults was presented by Lawrence E. Hinkle, Jr., M.D., and Norman Plummer, M.D., both assistant professors of clinical medicine at Cornell University Medical College.

They also found in the "ill" group a general susceptibility to all types of illness and accidents in contrast to the well-known phenomenon of specific susceptibility to certain forms of illness.

Their conclusions are based on the study of two homogeneous groups of industrial workers—1,237 women and 1,527 men—in a metropolitan

telephone company. The women were telephone operators and the men skilled craftsmen.

In addition to sex, occupation, and place of work, the members of each group were similar in age, cultural background, socioeconomic status, area of domicile, physical condition when first observed, nutrition, and environmental safety, sanitation, and general opportunity for exposure to infection. Each member of the groups had been continuously observed during his period of employment, some for more than 35 years, they reported.

## The Ill One-third

Hinkle and Plummer found that about one-third of each group accounted for more than three-fourths of the episodes of illness and four-fifths of the days of disability at-

tributable to the entire group. This finding, they said, confirms the results of other sickness studies of industrial groups.

Frequent minor illnesses, interspersed with major episodes, was the consistent sickness pattern for the "ill" one-third in each group, they said. This third, they reported, also had a disproportionate number of accidents, both major and minor.

They found that the many minor illnesses were scattered throughout many organ systems. The major illnesses were also in several organ systems, usually in those showing the most frequent minor disturbances.

The individuals who had the greatest number of bodily illnesses and accidents also had the greatest number of disorders of feeling state, thought, and behavior, they reported.

By contrast, they said, another one-third of each group had less than 5 percent either of illness episodes or days of disability. Members of this "well" group had a few scattered minor illnesses in several organ systems, and major illnesses after a long period of well-being were the exception rather than the rule.

### *The Stress Factor*

Pointing out that the data lend no support to the concept that one inferior organ system was the main cause of the ill health of the frequently sick persons, Hinkle and Plummer suggested that the persons in the "ill" group were exhibiting a disturbance of function of the whole organism and that each illness represented an isolated manifestation of a total and continuing pattern of reaction.

Good or poor health, they stated, was most clearly correlated with the individual's relation to his psychosocial environment in adult life. All of the ill men and women studied medically, they found, had difficulty in meeting the demands of their special life situation, and all of the well people had adaptive capacities uniquely suited to their life situation.

They observed that a number of the "ill" persons who had been healthy in childhood and had grown up in a benign environment began to develop illnesses when they were inadvertently precipitated into stress producing life situations that were not of their own making.

These observations suggest, according to Hinkle and Plummer, efforts directed at the study of the host may be as rewarding as past studies directed at disease syndromes.

### **Mental Health Is Called Keystone of Education**

Mental health is that quality which makes the acquirement and use of education possible, declared Dana L. Farnsworth, M.D., professor of hygiene, Harvard University, in a discussion centering around the opportunities for the school health worker or physician to promote mental health.

If it is assumed that education includes intellectual, emotional, social, and spiritual components and that it is the forerunner of wisdom, mental health is a keystone in the structure of education, Farnsworth stated. He defined mental health as "that state of mind in which one is not only free to go about the business of living but actually does so with zest and satisfaction."

Mental health in the schools, he declared, should be thought of in terms of the central purpose for which schools exist, that is, to enable pupils to make optimum use of the qualities, actual and potential, they possess. Accordingly, mental health is a matter of morale, of honesty, of concern with prejudice, discrimination, cheating, fanaticism, hatred, and how teachers and pupils think of one another.

Farnsworth suggested that instead of looking for formulas for the proper rearing or education of children, one might more profitably think in terms of attitudes and inner qualities. The really important matters, he said, are

habits of thoughtfulness, of thinking how it must appear to the other person, of awareness of the sensitivity of others, and of a general respect for people.

Training in feeling is fully as essential for the truly educated person as training of the intellect, he maintained, listing the following items which should be considered in the education process: the capacity to give and receive affection, the ability to show anger and to tolerate it in others, the recognition of the presence of strong instinctive reactions such as pride, jealousy, and fear.

### *The School Health Worker*

Mental health is everyone's business, Farnsworth said, but the school health worker and the teacher play especially important parts in the building of mental health, since they see and work with the child while fundamental attitudes toward life are still capable of betterment. They can also work with parents in a constructive direction, he added.

The important qualities needed by the school health worker and the teacher are an awareness of the need for and scope of mental health and the will to do something about it, he remarked.

It is the duty and the opportunity of the school health worker, he continued, to collect and assimilate knowledge gained from the study and treatment of the disturbed and unhappy youngster and to transmit that knowledge in the form of general principles to the classroom teacher. The teacher, on the other hand, sends to the health specialists a constant stream of information about his views of the school's educative process.

This process of working together and learning from one another helps to promote mental health in the school because it enables pupils to see good mental health in action, he explained. He pointed out that students learn infinitely more from what they observe in their teacher's behavior than from what they are told.

## Mental Hospital Studies - Pinpoint Research Need

Areas for needed basic research in mental illness have been sharply delineated as a result of the studies by the Warren State Hospital, Warren, Pa., and the National Institute of Mental Health, Public Health Service. For example, what happens to the discharged mental hospital patient is virtually an unexplored field.

Reporting for the hospital were Superintendent Robert H. Israel, M.D., and Nelson A. Johnson, M.S.W., director of social service. The Public Health Service was represented by two members of the institute: Morton Kramer, D.Sc., chief, Biometrics Branch, and Hyman Goldstein, Ph.D., chief, Current Reports Section, Biometrics Branch.

Their joint report concentrated on the trend in probabilities of separation from the Warren State Hospital—either alive or dead within specified time periods following first admission—for patients of specific age, sex, and diagnosis. Admissions to the hospital were analyzed on a cohort basis according to traditional life table methods.

### *The Cohort Studies*

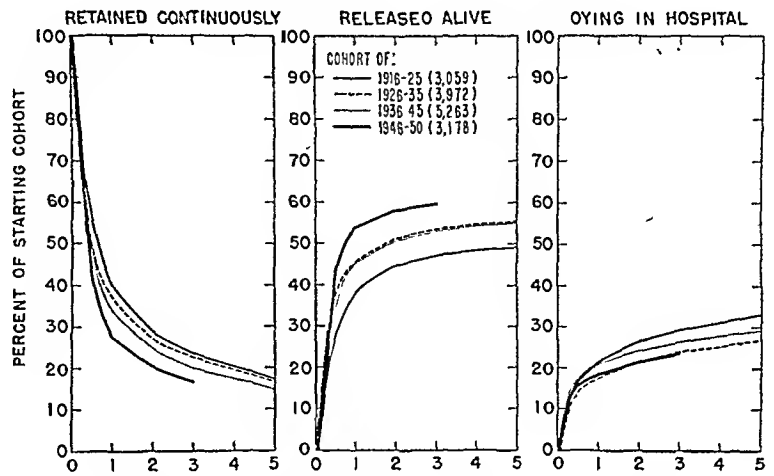
Persons admitted to a hospital for the first time, suffering from functional and syphilitic psychoses, now have increased chances of being returned to the community and decreased chances of dying in the hospital, the authors reported.

"Such facts are quite important in getting community acceptance of the mental hospital as an active, dynamic, medical facility, and in doing away with the idea that once a patient is committed he is lost to his family and to society forever," they pointed out. Among other purposes, the cohort studies were planned to provide historical data against which current mental hospital practices can be evaluated.

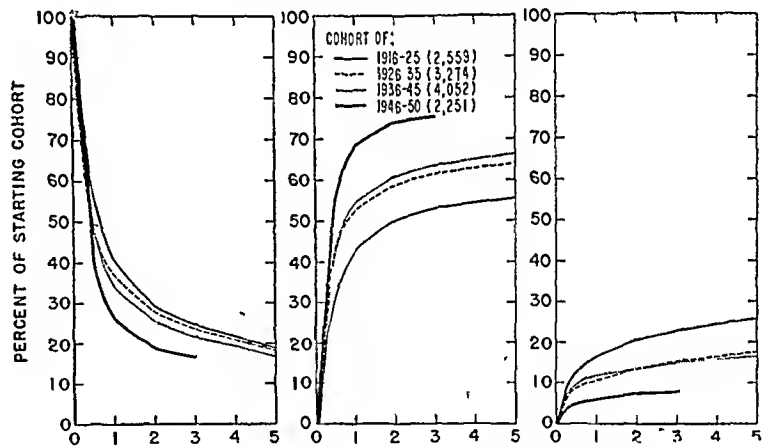
Warren State Hospital has abstracted data on first admissions since 1913. Because it offered a more

**Percentage of first admissions retained in Warren State Hospital (Warren, Pa.), released alive, and dead within specified periods following admission, 1916-50.**

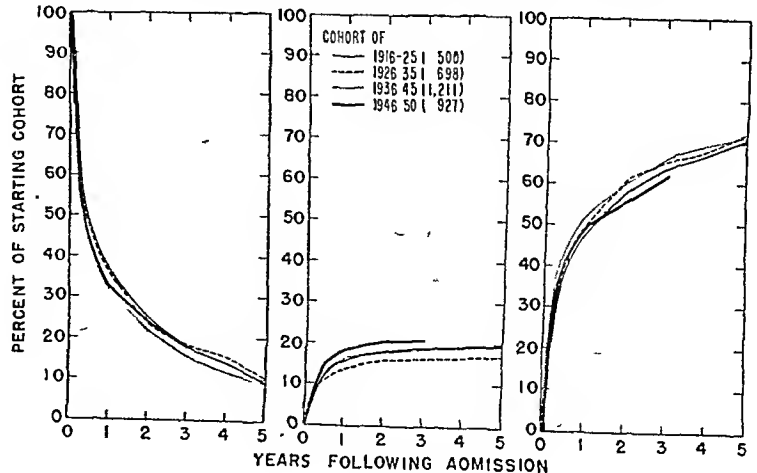
**All mental disorders, all ages, both sexes.**



**All mental disorders, under 65 years, both sexes.**



**All mental disorders, 65 years and over, both sexes.**



complete picture of admissions than did other mental hospitals, it was chosen for study. The periods 1916-25, 1926-35, 1936-45, and 1946-50 were compared because they coincided with events in the history of the hospital that might have had major significance in the treatment of patients. Findings were based on a study of the rates of release alive and of death in the hospital for a total of 15,472 men and women.

### *The Chances of Release*

Some of the facts developed by the studies and the questions they lead to are:

Of patients admitted in the period 1946-50, more were released alive within 1 year following admission than were released alive within 5 years of the patients admitted in the period 1916-25. In none of the periods studied was the proportion of patients released within 5 years after admission less than 50 percent, a much higher proportion than was expected.

The youngest patients, 15-34 years, have extremely high probabilities of release alive. Patients 75 and over have a very small chance of ever leaving the hospital alive.

Between 1916 and 1950, the first admission rate increased in all age groups, and particularly for the age group 65 and over. It increased 126 percent for the age group 75 and over.

*Does this mean a true increase in the incidence of mental disorder in the northwestern Pennsylvania area served by Warren State, or is it merely an increased use of expanding facilities?*

The probability of release in the first year following admission for patients with functional psychoses in the period 1946-50 was considerably in excess of what it was for patients admitted in each of the earlier periods.

*Does this mean that the various therapies used in increasing volume—electroconvulsive therapy, insulin, group psychotherapy, and occupational therapy—have been responsible for this increase in re-*

*lease rates, or have other factors been responsible?*

Patients with senile and cerebral arteriosclerotic psychoses have very small probabilities of being returned to the community alive. Their death rates, particularly in the first few weeks and months following admission, are exceedingly high.

*What are the social, economic, and familial factors responsible for bringing a very high proportion of moribund patients into the hospital?*

Functional psychotics, as well as other categories of patients not released in the first year of hospitalization, experience considerably reduced probabilities of release in the second and subsequent years of hospitalization. Also, patients admitted during 1946-50, who have attained their second and third years of hospital life, have approximately the same chances of being released in the following year as had similar groups of patients in the earlier cohorts of admission.

*What are the etiological and other factors responsible for long-term hospitalization? What treatment methods can be developed to make it possible to return more of these individuals to the community? What can be done to improve the lot of the patient who cannot be returned to society?*

### **Teacher Can Aid Child To Grow in Own Way**

*"Let me grow as I be,  
And try to understand why I want  
to grow like me;  
Not like my Mom wants me to be,  
Nor like my Dad hopes I'll be,  
Or my teacher thinks I should be,  
Please try to understand and help  
me to grow  
Just like me."*

This bit of verse, Helen T. Watson, R.N., said, expresses the kind of classroom freedom which has tremendous implication for schools and the mental health of children. Children need teachers who enjoy teach-

ing—and believe in the ability of children and adults to learn, develop, change, and grow, each in his own way. They need teachers who understand teaching, she said.

Watson, a consultant for school health services, Connecticut State Department of Education, emphasized the need for an atmosphere in the classroom which stimulates the child to grow and develop in accordance with his own capabilities and without the fear of unfavorable comparisons with his classmates.

### *For Those Who Teach*

Children need teachers who find ways of enriching their own personal lives, who are adequately prepared and willing to continue to study that they may more fully understand children who appreciate parents and seek opportunities for working with them, Watson stressed.

The personality of the understanding teacher calls for a healthy attitude toward differences in culture, racial and ethnic patterns of behavior, and the influence of social and economic status on behavior. Teachers and other school personnel must become familiar with differences in values and purposes of children in a multigroup society, she continued.

Children need educators who promote the kind of "atmosphere which permits flexibility whether it be in planning the curriculum, deciding on disciplinary measures, or establishing personnel policies," she said. This permissiveness can be successful only where there is relaxed, easy, interpersonal relationships between teacher and school administrator, teacher and teacher, teacher and pupil, and teacher and parent.

### *Classroom Tensions*

Educational leaders have made it clear that teachers who are unaware of what the lives of the children in their classrooms are like may unintentionally create and foster feelings of inadequacy and tension, Watson stated.



One educational practice that has stimulated such reaction is a system of grading scholastic achievement which is based on comparing the educational progress of one child with that of others in his class. Too often a child can construe this as failure and subsequently interpret it as punishment.

Indiscriminate isolation, as a punishment, may serve the teacher, she said, but not the child who interprets it as a point for being docile and submissive in order to be successful, Watson stated. Equally strong in their lasting influence on the child are the "constant nagging pressures" which stem from frequent experiences of hostility communicated by teachers and parents or from the failure of adults to accept normal childlike behavior.

"It should be recognized that

growth takes place slowly and that it may take the guidance and encouragement of several teachers through several years and grades to produce behavior changes in a child," Watson continued.

Not to be discarded are some very basic principles, which, when applied, can make positive contributions to the mental health of children. As examples of these precepts for teachers, she listed and discussed the following: All behavior is caused; the human personality grows in the direction of the best adjustment of which it is capable; the ability to face reality even though unpleasant must be encouraged; people face difficult situations with fight or by flight; it is neither necessary nor desirable to be too serious about teaching and guiding children.

science of radiological health. There should be no hesitation in asking such staff members to prepare themselves to understand and apply radiological health principles, he declared.

## *Requisites for Success*

On the basis of the New Jersey State Health Department's experience in developing a radiological health program, Bergsma said the following are essential for the success of such a program:

1. Training for field and office personnel.
2. Supportive legislation, in order to define the scope of authority to recommend radiological health controls wherever necessary.
3. Preparation of a concise declaration outlining proposed activities.
4. Ability to impart authoritative radiological health information and specialized advice to all interested parties.

## *Remaining Task*

Thinking in terms of public health administration, public health practice, and public health education, Bergsma said a tremendous task remains to be done. He listed the following objectives for the establishment of standards:

1. Administrative standards: To define in detail the extent to which public health administration of radiological health controls is desirable and feasible.
2. Educational standards: To suggest methods and provide information concerning inservice training in radiological health for public health and allied professional health personnel.
3. Regulatory standards: To establish methods of contacts and provide information for self-regulation by qualified groups or professions.

In Bergsma's opinion, a new governmental control agency is not needed to deal with the problems of radiation exposure. He believes the problems can be met by presently employed personnel. It may be, he remarked, that many of the problems cannot now be resolved by public

# Radiological Health . . .

*Problems of occupational and coincident radiation exposure can be dealt with cooperatively by health, legal, and industrial personnel. Training veterinary inspection personnel to evaluate radiation problems in food and food animals will reduce economic and dietary loss from food wastage.*

## **New Jersey Anticipates New Nuclear Industry**

New Jersey's fundamental approach to the problem of radiation exposure is occupational, specified Daniel Bergsma, M.D., M.P.H., commissioner of health, New Jersey State Department of Health.

Extension of the program to provide for protection of the general public, however, has followed naturally and necessarily, he said. The use of sources of ionizing radiation is essentially occupational, but the coincident exposures of the general public must also be considered, he maintained.

Citing the Atomic Energy Act of 1954 and the words of President Eisenhower concerning it, Bergsma predicted the appearance of new producers of nuclear energy within a relatively short time. This act opens the door, for the first time, for development of a private atomic power industry. He urged State and local health agencies to prepare, as soon as is feasible, to answer the many questions that will result from expansion of the nuclear industry.

It has been demonstrated, he pointed out, that public health engineers, industrial hygienists, and public health physicians and nurses are able to adapt themselves to the new



health personnel alone, but they will be solved by reference to other health, legal, and industrial problems with the assistance and support of respective experts in these fields.

## Radiation Effect on Food Concerns Veterinarian

Radioactive contamination of the environment is a potential threat to man not only directly but also through its effects on the animal population, Maj. U. S. Grant Kuhn III, VC, USAF, indicated in remarks on radiation hazards to the Nation's food supply.

Major Kuhn is veterinary officer, Atomic Energy Commission, Oak Ridge, Tenn.

Concerning ways in which animals might be exposed to radioactive elements, Kuhn said that fallout, or

radioactive dust, from a nuclear detonation may settle on herbage which is consumed by domestic animals, or this fallout may enter the food supply through the soil.

Pointing out that food wastage resulting from hysteria and misinformation is just as serious an economic and dietary loss as that resulting from unwholesomeness, he reported that a training program for veterinary officers of the Army and Air Force has been inaugurated to prepare them to evaluate radiation problems concerning food and food animals.

It is hoped, he said, that by training reserve officers and veterinary inspection personnel engaged in other public health organizational activities information may be eventually disseminated throughout that portion of the veterinary profession upon which the public depends for certification of a wholesome food supply.

ized region, he related. The approach is not rigid and methods will be improved through experience, he commented.

Routine measurements on a continuous basis provide information on dustfall, airborne particulate matter, and sulfur dioxide. Continuous records have also been obtained of visibility, extent of solar illumination, soiling index of the air by fine aerosols, and meteorological variables already mentioned, he reported.

Through environmental sampling techniques, areas of high and low pollution were selected and sampling stations were established in 28 census tracts in Detroit, he reported. The same procedure was followed in Windsor and 25 sampling stations were set up. On the basis of observations by these sampling stations, areas highly polluted and areas with low pollution, containing well-defined population groups and matched socioeconomically as far as possible, were selected for morbidity study, he reported.

The initial objective was to obtain information on the incidence of symptoms and illness among those in the various study areas, Katz related. This health study was started late in the summer of 1953, and the health records for the first year are now being assessed by a group of experts, he said.

## Control of Air Contaminants . . .

*A nationwide air sampling and evaluation study, measurement and reduction of odor, evaluation of bacterial air samplers, and toxic pollutants are among the air pollution subjects covered in this section.*

### Study Prolonged Exposure To Air Contaminants

Despite great advances made in the last 5 years, much remains to be studied toward elucidating the causes of acute symptoms leading to fatalities in air pollution disasters, according to Morris Katz, Ph.D., chairman, Canadian section, Technical Advisory Board on Air Pollution, Defense Research Chemical Laboratory, Ottawa, Canada.

Necessary for a sound approach to the problem of chronic injury are data of fundamental environmental

and meteorological observations on a continuous basis concurrently with measurements of ill health in properly established pollution and control areas, he asserted. Meteorological investigations needed include measurements of wind speed and direction, lapse rate and turbulence, temperature, humidity, precipitation, visibility, and solar illumination.

#### *The Detroit Study*

The Detroit-Windsor study is aimed at determining the effects of prolonged exposure to atmospheric contaminants of a highly industrial-

#### *Chronic Effects*

The atmosphere of industrial communities contains a great number and variety of organic and inorganic contaminants, he said. Complicating the situation are reactions of a photochemical and catalytic nature which occur between gases and vapors or between gases and particulate matter after liberation in the air, he asserted.

The inorganic fraction of the complex matter suspended in air includes a considerable number of metallic elements. The most abundant are silicon, calcium, aluminum, iron, magnesium, lead, and manganese.

Small amounts of zinc, copper, titanium, tin, vanadium, cadmium, and beryllium are also present. These elements represent about 10 to 20 percent of the total weight of the airborne particulates, he pointed out. A number of industrialized cities in the United States and the Windsor-Detroit area show only minor variations in the percentage composition, Katz said.

The composition of the organic contaminants is still largely unknown. It is probable that the organic fraction in air pollution is of greater importance in the study of chronic effects on health, Katz stated, than the inorganic material under normal circumstances in an industrial area. When the level of contaminants increases under adverse weather conditions, the concentration of the organic portion of airborne particulates tends to increase much more than the inorganic fraction.

## *Causes and Symptoms*

In the Donora case, U. S. Public Health Service studies concluded that no single polluting agent was present in sufficient quantity to account for the acute injury to the population's health, he said. Responsibility was placed on a synergistic factor involving some combination of contaminants.

The general and special physiological effects of the Donora and Meuse valley incidents are similar, he declared. The symptoms and signs were irritation of the eyes and respiratory tract followed by coughing, nausea, vomiting, headache, and dyspnea, he reported, and added that there were also varying stages of circulatory collapse, cardiac decompensation, and pulmonary edema.

Death was due predominantly to acute cardiac failure with or without obvious pathology, Katz said. The elderly, those with respiratory diseases, cardiovascular diseases, or asthmatics were the majority of victims.

## **Tells How to Evaluate Bacterial Air Samplers**

In recognition of the need for uniformity in the evaluation of bacterial air samplers, William Lester, Jr., M.D., Chicago University associate professor of medicine, presented an outline of tentative methods for determining their efficiency. He remarked that no foolproof technique exists. Only by the laborious checking of each variable can valid results be obtained, he said.

Essential to Lester's outline is the understanding of the meanings of collection efficiency and retention efficiency, which he explained. Both efficiencies, he said, should be determined for each sampler studied. He outlined the following procedures as necessary to the detailed evaluation of the physical and biological performance of a specific sampler. Once the procedures have been found valid, he added, a short cut becomes evident.

## *Suggested Outline*

1. In order to obtain reproducibility and uniformity of particle size distribution as a basic prerequisite for any comparative analysis of sampler performance, it is necessary to control these parameters: temperature, relative humidity, conditions of atomization, chemical constituents used in the culture media and atomizing vehicle, rates of flow and sampling, position and site of sampling, and also the metabolic and functional status of the biological agents used.

2. It is difficult to obtain satisfactory control of all these factors in a static chamber because of the interference of various local variables; therefore, to obviate these difficulties, a dynamic chamber should be used in conjunction with a nonreflux type of constant delivery atomizer, in which the aerosol is generated and evacuated at a uniform rate.

3. Collection and retention efficiencies should be determined upon a quantitative basis using an inert, nonvolatile, stable aerosol. They

should be determined for the various rates of flow and over different ranges of particle size so that the specific physical efficiencies of the sampler can be fully characterized.

4. Whatever tracer technique used, whether the aerosol contains water or oil soluble dyes, specific chemical tracers, or radioactive agents, it is important that the technique be capable of accurate quantitative measurement in low concentrations and that the substances used are uniformly distributed throughout all the particles contained in the aerosol.

5. The determinations of efficiency should be made upon both wet and dry aerosols of various (suggested) particle size ranges, from the largest size capable of aerial dispersion down to the minimum diameter of particles capable of containing a bacterial cell.

6. Studies should be made of the collection and retention efficiencies of a specific air sampler for biological aerosols made up of viable bacterial cells because many factors present in atomization and sampling can influence the survival of bacterial cells.

7. The basic comparative evaluation of bacterial air samplers must be made upon aerosols containing only micro-organisms of species normally dispersed into the air by human beings. All cultures should be carefully standardized as to their state of growth.

8. The evaluation studies with bacterial aerosols should follow the same general procedure advised for the determination of physical collection and retention efficiencies but using bacterial counts instead of colorimetric or gravimetric determinations.

9. Because of the profound influence of relative humidity upon the size characteristics and survival of bacterial aerosols, it is worth while to correlate the efficiency and performance of any given sampler with various (suggested) relative humidities.

10. The same ranges of particle size distribution advised for the inert

clouds should be studied for use with the bacterial aerosols.

## Engineers Measure Odor, Now Reduce Its Effect

An industrial plant's air pollution control program using \$2.8 million worth of equipment and requiring \$700,000 annually to operate was described by Virgil E. Gex, in charge of pollution control engineering, Procter and Gamble Company, Cincinnati, Ohio.

The cost breakdown, he reported, shows that \$1.4 million was spent on cyclones and filters for process exhausts. The \$250,000 annual operation cost, he said, is believed to be exceeded by the value of the material recovered.

Cyclones and filters for room dust control systems cost \$400,000 to install and \$80,000 per year to operate, he said, and added that recovery from such systems is not believed to pay its operating expenses. One million dollars has been spent on equipment to reduce, eliminate, or dispel odors, Gex reported. The operating costs for this equipment runs over \$400,000 per year, he commented, and there is no product recovery.

### Odor Research

Work on odor control began 9 years ago, he said. The first problem was a lack of any quantitative concept of odor. The conventional approach had several weaknesses and a method of measuring odor directly was developed.

He defined an odor unit as the amount of odor necessary to contaminate 1 cubic foot of air to the odor threshold—a level barely detectable by the sense of smell.

### Osmo

To find an odor unit, a sampling device, nicknamed the "Osmo," was developed. It uses a continuous flow of 10-20 c.f.m. of odor-free reference air into which increasing amounts

of odorous sample is introduced until odor is found in the exit mixture, Gex explained. This gives a ratio upon which to base measurements in odor units per cubic foot, he added.

Once emission rates for various discharges in order units per minute can be calculated and compared on a common basis, Gex declared, odor reduction efforts can be more easily concentrated on big discharges first.

Odor emission rates can also be used to calculate how high a stack should be to keep the maximum ground concentration below one odor unit per cubic foot, he pointed out.

Osmo has made it possible to use lower and more efficient temperatures in several furnaces used to deodorize process exhausts, he added, and thus to save \$50,000 annually, on fuel bills.

### Odor Control

Four methods employed and examples of their application to control odor pollution, Gex related, include stack dispersal and:

**Operating techniques.** Reduction of odor discharge by changed operating technique involves little investment. Conventionally, cleaning tank cars involved liberal steaming. The excess steam, escaping from the tank car carried a good deal of rancid fat odors. A satisfactory steaming procedure was worked out, eliminating the odor nuisance.

**Process change.** One batch operation process discharged odors during one part of the batch cycle. Although more expensive, the processing was converted to a continuous operation to reduce the total odor discharge. Also, changing from line steam to recirculation jet in the acidulation of soap stocks reduced odor discharge to  $\frac{1}{500}$  of its former value.

**Control equipment.** A variety of equipment is used including spray condensers, enclosed vent systems, packed scrubbers, Venturi scrubbers, odor furnaces, activated carbon filters, centrifugal separators, and air filters.

## Nonspecific Irritants in Air Implicated in Smog Studies

Citing "unquestionable evidence that air pollution can contribute to health impairment," Norton Nelson, Ph.D., of the Post-Graduate Medical School, New York University-Bellevue Medical Center, concluded that nonspecific irritants acting additively may be one of the most important toxic effects of air pollutants for the respiratory system. Dr. Nelson is professor of industrial medicine and director of the school's Institute of Industrial Medicine.

On the basis of available data concerning effects of respiratory irritants, Nelson advocated further study of the following points:

1. The probability that a person already under stress may suffer significantly from a level of an irritant innocuous to a healthy person, and, similarly, the possibility of enhanced susceptibility of the very young and the very old.

2. The possibility that the physical state of pollutants influences their effects on the respiratory system.

3. The possibility that irritants other than those conventionally accepted as important may contribute to the problem.

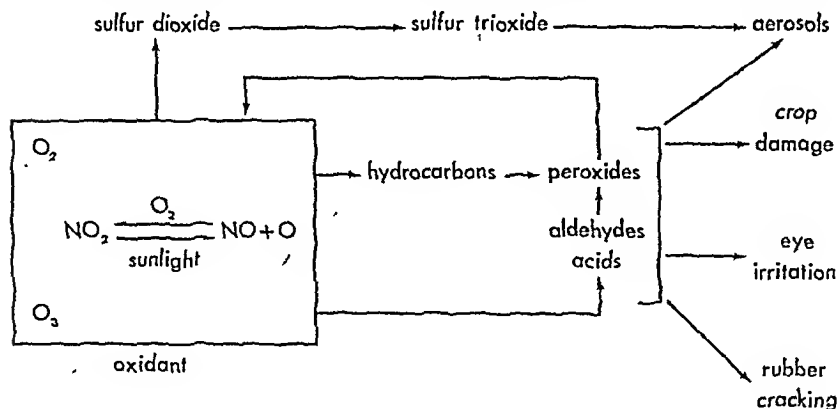
### Donora and London

The difficulties observed during the Donora, Pa., smog of 1948 and the London fog of 1952 seem to be attributable to the fact that a non-specific respiratory irritant or group of irritants impose an additional stress on an already overburdened respiratory or cardiac system, Nelson specified.

Investigation of the Donora incident has shown, Nelson said, that a real and systematic increase in "complaints" occurred and that they occurred with greater frequency where preexisting disorders were present.

Nelson noted also that there was unquestionably an association between the increase in the concentration of sulfur dioxide in the atmos-

**Schematic presentation of the mechanism suggested by Haagen-Smit to explain the observed effects of smog in Los Angeles.**



phere and the increase in deaths during the London fog. Nelson felt, however, that other irritants may have been important.

## Functional Changes

That air contaminants may produce functional changes, as contrasted with organic changes, has been suggested by studies on the effects of inhaling sulfur dioxide and sulfuric acid mists, Nelson stated. Amdur and associates showed that reflex changes in pulse rate, tidal volume, and respiration rate occur with the inhalation of these substances at levels well below the detection threshold.

Since the functional operation of an organ may be distorted or modified by a toxin without leaving any evidence of trauma if the insult is survived, Nelson advocated a search for such functional changes in relation to air pollutants.

Another significant point demonstrated by these and other studies is that sulfur in the form of sulfuric acid appears to be as much as five times as toxic as sulfur in the form of 'sulfur dioxide,' Nelson stated. This may arise from the fact that sulfuric acid is a stronger acid, but Nelson considered equally or even more important the fact that sulfuric acid exists in the form of particles, whereas sulfur dioxide exists in the form of a gas.

Evidence suggests that the depth of penetration in the lungs of water-

soluble gases may be increased when they exist in the form of very small particles, he said, theorizing that, if this be so, irritants borne by small particles may reach a more susceptible tissue and therefore produce increased toxicity.

## Lung Cancer and Air Pollution

Nelson considered the available data bearing on a relationship between general air pollutants and lung cancer inadequate as a basis for any definite conclusions. He summarized the present knowledge of this subject as follows:

1. There is probably a higher incidence of lung cancer in urban than in rural groups.
2. Urban and industrial centers have higher concentrations of known carcinogens than areas with less air pollution.

## Discuss Increased Accent On Air Pollution Studies

Airborne effluvia resulting from man's own activities have emerged lately as nuisances, causes of severe economic loss, contributors to discomfort, and occasionally, as killers, Leslie A. Chambers, Ph.D., Vernon G. MacKenzie, B.S., and Milton J. Foter, Ph.D., reported.

Dr. Chambers and Dr. Foter are with the Robert A. Taft Sanitary

Engineering Center, and Mr. MacKenzie is with the Division of Sanitary Engineering Services, Public Health Service.

Air pollution is a problem of such magnitude that no one locality, no national center, can be expected to make significant progress without coordination and collaboration with other groups, they stated.

Irritating and damaging smogs, such as the one at Donora, Pa., have made clear that smoke abatement is only a facet of the problem, Chambers and his associates said. Recent technical literature stresses the complexities of air sampling, the identification and control of specific pollutants, the chemical reactions in the air, and the economic and health effects of airborne substances.

Air pollution episodes less severe than that in London in 1952 occur in many places. A mechanism for correlation of vital statistics with pollution variables is necessary, Chambers and his associates said.

Prior to 1954 the Sanitary Engineering Center initiated three exploratory projects: (1) the nationwide sampling program seeking knowledge of the amounts of particulate material in the air over a group of arbitrarily selected cities; (2) an attempt at statistical correlation between available mortality data from a large metropolitan area and measured meteorological and pollution data covering the same period of years; and (3) a continuing effort in assembling information concerning local evaluation, investigation, and control of air pollution and its problems.

Now five types of activities are being started:

1. Expansion of the exploratory sampling network, including more problem areas as well as intensification of study in areas already activated.
2. Immediate initiation of work on the evaluation, and where necessary, the development of sampling equipment and analytical procedures for gases and volatile substances.
3. Study of physiological effects

of air pollutants so that control standards can be established.

4. Extension of the exploratory attempt at correlation between pollution loadings and mortality data to include several other cities.

5. Initiation of a technical study of community control patterns related to the air pollution problem.

The objectives of the last study, Chambers and his co-workers said, will include the determination of necessary survey patterns; procedures for obtaining unified support for programs in regions involving more than one governmental unit; probable legislative requirements and other guideline data.

said, they are indirect and partial indicators of the basically intangible characteristic of patient care.

### *Clinical Judgment*

Clinical evaluations, while less precise, may be more valid since they offer a more direct approach, she said. In this type of appraisal, she explained, qualified consultants appraise hospital records in the various clinical fields, such as medical, surgical, obstetrical, nursing, and social service, and score the performance according to prepared standards.

There are, she said, widely accepted concepts of what is meant by good care, and thus the reliability of qualitative judgment can be tested and subjected to statistical analysis. Sheps stressed the need to obtain the appraisals of several independent judges. "Only through separate evaluations is it possible to assess the consistency of the individual judgments and to arrive at a relatively unbiased estimate," she said.

Sheps pointed out that although any of the four approaches to the quality of hospital care involves comparisons, either indirectly through the use of standards or directly, the basis of comparison is vital in program evaluation.

If a specific procedure has an effect on quality, it must be revealed in differences, she said, adding that to find such differences, the hospital under study must be compared with something—either with other hospitals or with its own earlier performance.

### **Lack of Data Complicates Hospital Care Comparison**

Because diseases are the same throughout the country, every hospital patient should have the same good care, no matter where he resides nor what hospital he enters, said Paul A. Lembcke, M.D., associate professor of public health administration, Johns Hopkins Uni-

## Hospitals, Home Care . . .

*Measurement of quality of hospital care, reimbursement problems of regional hospitals, and the advisability of a hospital-operated home care program for special disease conditions are discussed in this section.*

### **Approaches to Measuring Hospital Care Quality**

Methods of measuring the quality of hospital care were discussed by Mindel C. Sheps, M.D., M.P.H., research associate of the department of biostatistics, Harvard University School of Public Health.

Most of the work done to date has been related to setting minimum or desirable standards for accreditation and in stimulating improvements in hospital care, Sheps stated. The field of program evaluation is just beginning to be explored, she said.

#### *Main Approaches*

Sheps described four of the main appraisal techniques that can be used alone or in combination: (1) examination of prerequisites for adequate care, such as minimum or optimum levels of facilities, equipment, professional training, or organization; (2) performance elements, such as autopsy and cesarean rates, or accuracy of diagnostic procedures; (3) results obtained on patients, such as

postoperative, puerperal, and neonatal mortality rates, or incidence of postoperative infections; (4) qualitative clinical judgment.

Any of the appraisal indexes and standards used should be clearly defined, based on comparable data, and examined for reliability and validity, Sheps said, adding that statistical controls and analyses should be applied to the clinical appraisals as well.

As one of many examples illustrating the need for study of appraisal indexes and the difficulty of setting valid standards, Sheps cited the use of postoperative death rates as an index to effective care: "Does the death rate within 10 days after major chest surgery really reflect the quality of care? What about the effect of such patient characteristics as diagnosis, complicating illnesses, age, sex, and nutritional status?"

The first three techniques were termed objective indexes that hold considerable promise for the appraisal of hospital care. However, she pointed out, they are not yet the ideal measuring tools. At best, she

versity School of Hygiene and Public Health.

If a hospital is not equipped with staff and facilities to provide care of good quality for certain diseases or conditions, that hospital should refer such cases to hospitals that are better equipped, Lembecke maintained.

Regional organization of hospitals, he believes, is one important method by which the integration of needs and resources can be accomplished.

Preferring to avoid using different standards for different hospitals, Lembecke recommends the publication of more actual data as essential to measuring the quality of hospital care. He pointed out that conclusions based on studies made in one hospital alone, not related to all hospitals in the community, tended to be erroneous or actually misleading because the patients are a select group and not representative of the general population.

He said data such as those published by the Saskatchewan Hospital Services Plan, the Windsor Medical Services, and the Health Insurance Plan of Greater New York had proved helpful in measuring his own studies in Rochester, Indianapolis, Petersburg, Cooperstown, and other areas.

Lembecke cited the need for figures on excessive surgery and on the incidence of certain diseases as an approach to the use of quantitative methods of measurement. "I know," he said, "this is often a very ticklish subject, studies being made chiefly in hospitals where it is suspected that the quality is not what it should be." But the identity of the hospitals studied need not be made known, he countered.

### Boston Home Care Study Tests Selectivity Benefit

A home care program will be more effective if it serves all types of illness rather than limited disease categories. This conclusion was drawn from the results of a 2-year trial

### Comparison of services for study group and control group in Boston City Hospital home care program

Service	Study group (55)	Control group (35)
Physicians' home visits.....	1,515	-----
Home visits per patient.....	27.5	-----
Outpatient department visits.....	80	231
Visiting nurse association visits.....	1,030	393
Visits per patient.....	18.7	11.2
Percent of patients visited.....	58.2	31.4
Frequency of visits (weekly).....	2-3	1-2
Hospitalization:		
Total days.....	857	434
Number of admissions.....	50	39
Admission rate per 1,000 patients.....	909	1,115
Cardiac hospitalization:		
Total days.....	203	239
Number of admissions.....	10	27
Admission rate per 1,000 patients.....	182	772
Noncardiac hospitalization:		
Total days.....	654	215
Number of admissions.....	40	12
Admission rate per 1,000 patients.....	727	343

home care program for selected Boston City Hospital cardiac patients.

Reporting the study were Henry J. Bakst, M.D., professor, and Edward F. Marra, M.D., instructor, department of preventive medicine, Boston University School of Medicine.

Under the conditions of the study, 55 persons in the study group and 35 persons in the control group were selected at random from hospital ward cardiac patients. Both groups were discharged home without care by a private physician. The patients were comparable in severity of illness and economic and social status.

Patients in the study group received individual medical care on a 24-hour-a-day, 7-day-week call basis in their homes or, if necessary, in the outpatient department; visiting nursing care; and social services by the hospital medical social worker and community agencies.

Home examinations included electrocardiograms, venipunctures, and thoracenteses. Medical services included dressing of varicose and post-phlebotic ulcers, applications of Unna's paste boot, and, in one instance, placement of improvised drainage tubes.

The control group received medical care in the outpatient department or through emergency home visits that were usually followed by rehospitalization.

### Range of Illness

The intensive home care reduced the rate of hospitalization for heart disease, they reported, but it increased materially the hospitalization rate for noncardiac disease. Thus, they said, the total rate of hospitalization in both groups for all causes was essentially comparable.

Readmission to the hospital because of exacerbation of cardiac symptoms occurred more than four times as frequently in the control than in the study group, they explained, but hospital readmission for noncardiac diseases was more than twice as frequent in the study group (see table).

Since the hospitalization costs were about the same for both groups, the home care service for the study group was an additional cost item, they reported. However, they pointed out, the home care service permitted better and more effective med-

ical service and thus isolation of the costs is difficult if not unrealistic.

The amount of associated disease found in the study group indicates that comprehensive medical care programs actually increase the variety of services needed by aged or chronically ill groups, Bakst and Marra observed. The Boston experience, they said, emphasizes the contribution an effectively organized and developed home care program can make through case finding, early diagnosis, and treatment of incipient illness.

Attempts to develop programs for a single disease category are probably unjustified except to form a base for broader and more inclusive services, they concluded.

## Children's Hospitals Face Reimbursement Problems

Under present conditions, the regional hospital assuming responsibilities for the rehabilitation of various childhood disabilities is operating at financial disadvantages, according to Lendon Snedeker, M.D., M.P.H., and Edward S. Lancaster.

Dr. Snedeker is assistant administrator, Children's Medical Center, Boston, and Mr. Lancaster is its comptroller.

Burn cases cost the hospital \$31.86 a day, but it is reimbursed \$27.03, they said. These patients require an average 105 days of bed care. Daily cost for congenital heart disease patients varied from \$31.73 to \$50.50, but the reimbursable cost is \$26.99, and the ward charge, \$17.00. On these youngsters, the hospital loses an average \$50-\$100, or more. In cases of cleft palate and harelip, the cost situation is more favorable to the hospital.

Reconstructive surgery in such situations has been undertaken with the implicit understanding that the charge per day or per case will considerably exceed the standard reimbursable cost figure, but it is doubtful that the two will ever balance out. Even though it operates

at a financial loss, the hospital must live up to its obligations in the fields of service, teaching, and research.

The administrators suggested that regional problems be financed on a regional basis in order to eliminate the dispensing of charity from local funds. One-third to one-half of the rehabilitation cases admitted to Children's Medical Center come from outside the Boston area, yet it, like other large children's hospitals, is the logical reference point for the difficult rehabilitative cases. Repeated spot checks have shown that these children are referred for a wide variety of conditions, most of which cannot be effectively diagnosed or treated in their own communities.

More figures are needed as to the rehabilitation costs for various types of childhood disability, both from the standpoint of the funding agency and of the hospital providing the service, Snedeker and Lancaster said. With this in mind, the medical center has begun to maintain a register of children admitted for such care. Also needed is a thorough case study for the total cost of finding, diagnosing, and adequately treating any particular childhood handicap, they pointed out. Such study ought to ascertain family outlay for private medical care and travel as well as the expenses incurred by the family or any medical agency for special operations, after-care, and training.

## Nutrition in Institutions . . .

*Food planning in institutions, cooperation between State and local health agencies in providing nutrition services, standards for hospital diets, and food practices in nursing homes are the subjects of this series of papers.*

### Ohio Nutrition Service Aids Local Institutions

Cooperation between State and local agencies can help meet the responsibility for providing nutrition services for institutions, according to Ralph E. Dwork, M.D., M.P.H., acting director of the Ohio Department of Health.

Institutions such as general, tuberculosis, or mental hospitals, children's or nursing homes, and homes for the aged frequently need help with their nutrition problems, Dwork said, pointing out that local health departments cannot always meet this need. State consultation services, he believes, should be made available in many areas of service—in preplanning kitchen layout, in

teaching best use of equipment, in menu planning, in food purchasing, in preparation and serving of food, in control of wastes, and in control of costs. The Ohio State Health Department provides these services when the local units cannot or do not provide them, he stated.

The availability of trained personnel has not kept pace with the stepped-up hospital building program in Ohio, Dwork reported. He said that Ohio has directed its building efforts toward the smaller cities and rural areas, its areas of greatest need. This expanding program, still short of the recommended goal of 4.5 beds per 1,000 patients, creates a greater need for dietary personnel.

In Ohio today, 90 general hospitals, 14 tuberculosis hospitals, 19



mental hospitals, 140 children's homes, and over 600 nursing homes and homes for the aged have inadequately trained dietary personnel, Dwork reported. Hospitals in the larger cities, with higher salaries, shorter working hours, and offering better professional associations appear to be more attractive to the trained, Dwork asserted.

Dwork said that inservice training of untrained dietary workers under direction of a trained dietitian is a possible solution to the shortage problem in some cases. Another way out, he said, is joint hiring of a qualified dietitian by several institutions.

## *Exploring New Areas*

The principle of offering service to local health departments and not directly to local communities guides the policy of the Ohio State Health Department, Dwork pointed out, but Ohio entered the field of dietary consultation direct to institutions on the basis that a State health department should explore new areas, whether or not called upon by the local departments to do so. The State, he said, will relinquish this function when the local health departments take over the task. In the meantime, local health departments are helping jointly with training, demonstration, and instruction of individuals or groups of patients, Dwork reported. Food sanitation services, Dwork said, are a local responsibility wherever and whenever possible. When not possible, he implied, it becomes the State's affair.

## **Indiana Aids Hospitals in Food Planning**

Indiana has been among the first of the States to recognize the importance of nutrition in institutional care, Margaret A. Dunham, M.S., chief nutritionist of the Indiana State Board of Health, reported.

In January 1948 the State board of health employed an institution nu-

trition consultant to help the 129 general and allied special hospitals, 74 children's institutions and day nurseries, and the 33 county homes for welfare recipients with their dietary and food service problems, Dunham said.

More recently, in July 1943, she reported, the 17 mental and correctional institutions were included in the improved food program when a dietary consultant was added to the staff of the board's newly formed mental health commission.

During the past 6 years, Dunham said, the institution nutrition consultant's work has covered four major areas: surveys to check compliance with the nutrition standards required for annual State licenses; consultant services to individual hospitals; consultation on dietary facilities in new or remodeled hospitals; and group instruction.

The initial survey of the then 124 hospitals revealed that in 63 hospitals, food service was supervised by untrained persons, Dunham reported. Only 52 employed a trained dietitian, and in 9 a home economics graduate was in charge of the dietary staff. Since 56 of these hospitals had 50 beds or less, they obviously could not afford a trained dietitian and needed the consultant's help, she said.

The consultant reported a general lack of understanding by the hospital personnel about the makeup of a nutritious diet, Dunham said. Many hospitals needed help in planning general and modified menus and in improving food service to patients and personnel, food preparation and storage methods, dishwashing procedures, arrangement of kitchen equipment, and economical food purchase, she said.

Surveys of the children's homes revealed that many of them were planning meals more suitable for adults, Dunham said. Meals are often inadequate in quantity for teen-agers. They lacked variety, and combinations were unattractive; suppers often consisted of leftovers from the previous meal.

During the past year, Dunham reported, 26 hospitals requested assistance from the nutrition consultant. In addition to a monthly evaluation of their menus, she has made 4 or 5 visits to the hospitals.

Dunham told of the consultant's work in a 27-bed tuberculosis hospital—a typical example of her assistance.

On her first visit to the hospital in 1949, Dunham said, the consultant found the menus were low in green and leafy vegetables; eggs were served only twice a week, and suppers consisted of food served cold plate style. Menus were planned on a day-to-day basis.

The consultant, she said, has been instrumental in bringing about the following improvements: menus that will more nearly meet the nutritional requirements of tuberculous patients; purchase of milk in individual containers for the patients; installation of new dishwashing equipment; replacement of a wornout, two-compartment sink; and better food-purchasing methods.

Dietary conferences have been held for hospital personnel since 1951, Dunham reported, and a series of 1-day institutes have been organized for matrons, board members, and cooks in the children's homes.

## **PHS Studies Standards For Hospital Diets**

Nutrition standards provide hospitals with a yardstick with which to measure adequacy of foods, stated James M. Hundley, M.D., chief, Laboratory of Biochemistry and Nutrition, National Institutes of Health, Public Health Service, Bethesda, Md.

They also serve as a baseline for the management and control of food and for the preparation and review of budgetary requests, he continued, and they are particularly useful when a number of hospitals are supervised from a central point.

Hundley suggested, however, that, because of the variation of nutrition-



al needs in different types of institutions, standards should be sufficiently flexible to account for local circumstances. Probably no single nutrition standard can be applicable and valid for all hospitals, he said.

Today's nutrition standards might better be called nutritional goals, Hundley said. The standards recommended are the result of studies made in 1952 and 1953 in five completely different types of Public Health Service hospitals—general medical and surgical, neuropsychiatric, tuberculosis, leprosy, and research.

Modifications of the dietary allowances recommended by the Food and Nutrition Board of the National Research Council for healthy, physically active persons were used as the basis for the nutrition standards in all of the hospitals in the study, Hundley said. The hospital diets were noticeably higher in protein, vitamins, and minerals than the diets recommended by the Food and Nutrition Board.

### *Hospital Standards*

Patients in the general hospitals are usually males who are accustomed to a physically active life and to a relatively high food intake, Hundley said. A large proportion are ambulatory during their entire hospital stay and an appreciable number are nutritionally depleted when admitted. Some modification in favor of protein and vitamin C content was made in these hospitals to account for trauma, surgery, and other hospital factors.

Mental patients frequently eat little or develop bizarre food habits, and it is important that the food served them be high in quality and in nutrient content, Hundley stated. He said that the majority of the patients in neuropsychiatric hospitals are ambulatory, and that many of them work about the hospital station doing heavy farm labor, dairy-ing, and other physical work.

In both the tuberculosis and leprosy hospitals, diets are high in calories, protein, minerals, and vita-

mins, including vitamin D. Most of the patients in these hospitals are undernourished on admission, and many of them are bedridden for long periods and cannot get out into the sunshine.

The standards for the research hospital—Public Health Service Clinical Center—were set up before the hospital was put into operation, and were based on an average of the nutrition standard set up for general hospitals in this study and on similar standards set up by the Food and Nutrition Board for physically active women, Hundley stated.

### *Standards Practical*

Reports on nutrition in 4 general, 1 tuberculosis, and 1 leprosy hospital indicate that the nutrition standards are practical and that food costs are reasonable, Hundley said. In the 4 general hospitals, standards were met or exceeded as follows: calories, 2 hospitals; protein, vitamin A, riboflavin, and ascorbic acid, all 4; calcium, 2; thiamine, 1; niacin, 1, and iron, 3.

Diets in the tuberculosis and leprosy hospitals met or exceeded the nutrition standard, Hundley said, except that the tuberculosis hospital failed by a very slight margin to meet the calcium standard.

## **Nursing Home Nutrition Theory Versus Practice**

If the diets for patients in nursing homes are to be adequate in amount and in the essential nutrients, and if the food practices in these homes are to meet good standards, more information is needed on how actual food and nutrition practices compare with good theoretical standards.

Joseph H. Kinneman, M.D., deputy commissioner of health, and Ruth Nelson, R.N., public health consultant for institutions, Nassau County Department of Health, John H. Browe, M.D., director, and Elizabeth Agnew, nutritionist, bureau of

nutrition, New York State Department of Health, reported the findings of a cooperative study of 20 licensed nursing homes in Nassau County, N. Y. The study, made in the summer of 1954, agreed completely with the cumulative records maintained by the local health department since 1941.

All homes had a sufficient supply of canned goods to last a week, and 65 percent had adequate supplies for a month; supplies of perishable foods were sufficient in most to last a week.

In most instances, food storage was better than in public eating and drinking places. No dietitian or a person with training in nutrition was employed in any home, and in most places, the cook was given little or no supervision or direction.

The quantity, preparation, and service of food were good. The heartiest meal was served in the middle of the day. Dining rooms or dining areas were seldom used, even when available; tray service was the rule. Regular diets did not always include the "basic 7." Vegetables and fruits, particularly a daily serving of green or yellow vegetables and citrus fruit, were not the rule, but all homes made some provision for special diets.

Water supplies, sewage disposal facilities, dishwashing practices, and food handling techniques were good in all, and these practices were better than those found in commercial eating establishments. The frequency of garbage collection was satisfactory, but garbage storage was not.

### *Suggestions and Recommendations*

Kinneman and his co-workers made these suggestions for changes and improvements in food and nutrition practices:

More use of garnishes to make food attractive in appearance.

A later supper hour—in only 15 percent of homes was there a 10-hour interval between breakfast and supper.

More careful supervision of the cook, and development of menus and standardized recipes subject to approval by a person qualified in the field of nutrition.

Expansion of kitchen space, replacement of old equipment, and addition of mechanical aids to food preparation and to food and utensil care.

Improvement of the physical setup of dining areas and the encour-

agement of more use of dining room facilities.

More attention to the modification of special diets, according to changes in the clinical condition of the patient.

Finally, Kinneman and his colleagues suggested that a study be made of a comparable group of nursing homes, which have been subject only to accreditation by a State agency, for comparison with the findings of the Nassau County study.

is rapidly lost on dilution of serum and passed through embryonated eggs. Death of eggs in 2-6 days was the endpoint.

Experiments were conducted with 26 persons exposed to NDV and 26 controls. Serums from 21 of the 26 exposed individuals neutralized more than 10 ID<sub>50</sub> doses of NDV as did one serum from the control group, due to a cross reaction with mumps antibody. High neutralizing activity, inhibiting over 10,000 ID<sub>50</sub>, was present in the serums of 11 exposed subjects who had a history of conjunctivitis.

Despite frequent and intense exposure by the respiratory route, there was no history of frequent or severe infections of an influenzal nature, he reported.

## Tentative Hypothesis

Evans opinion is that NDV is only capable of producing conjunctivitis in man. The possibility of mild respiratory illness cannot, however, be entirely excluded, he commented, but depends on the emergence of variants with greater human pathogenicity. The ability of some mumps immune serums to inhibit NDV may indicate more than one mumps strain, one of which shares antigens in common with some NDV strains.

As the interaction of certain infectious mononucleosis serum and NDV is mediated only through red cells altered by NDV, this may represent a chance uncovering of a new antigen on the red cell surface by NDV which makes them agglutinable by such serum, he suggested.

## New Antityphoid Agent Shows Promise

A single injection of purified Vi and O antigens, the components of *Salmonella typhosa* considered important in immunization against typhoid infection, evokes the production of higher levels of antibody than a complete course of three injections of the conventional killed bacilli vac-

# Immunology . . .

*The avirulent rickettsial strain vaccine used experimentally against epidemic typhus and the live virus vaccine used in the Georgia rabies epidemic in dogs are favorably reported. A properly conducted neutralization test is preferred for the immunological diagnosis of Newcastle disease virus, and a new antityphoid agent offers promise.*

## Newcastle Disease Virus Neutralization Test

In immunological diagnosis of Newcastle disease virus (NDV), a properly conducted neutralization test is the technique of choice in the opinion of Alfred S. Evans, M.D., of the departments of preventive medicine and medical microbiology, University of Wisconsin School of Medicine.

Diagnosis, whenever possible, should rest on isolation of NDV in a laboratory free from possible accidental contamination, he asserted.

An immunological diagnosis should be made carefully and only after nonspecific inhibitors have been eliminated, and the serum has been shown to contain no mumps antibody, he said.

Primarily an acute infectious disease of fowl, Newcastle disease is of importance as a possible human

pathogen because of its striking resemblance to the mumps-influenza virus group, he commented. NDV has been established as a cause of acute conjunctivitis in humans, but the relation of the virus to acute hemolytic anemia is not certain.

Laboratory work on analysis of NDV by hemagglutination, complement fixation, and neutralization tests has resulted in confusing and misleading data, he asserted, and it has been difficult to establish the presence of NDV antibody in human serum.

## Recommended Test

Evans outlined the procedure for the recommended neutralization test as follows:

Serums were heated at 56° C. for 30 minutes to destroy nonspecific heat-labile component. Undiluted serum was mixed with varying dilutions of virus, since antibody effect

cine, reported Maurice Landy, Ph.D., chief, department of bacterial immunology, Army Medical Service Graduate School.

On a weight basis, only 10 percent as much of the purified antigens are needed to yield a superior immunological response, he reported.

Elimination of extraneous and possibly harmful bacterial components is also an important advantage offered by the use of purified antigens, he added.

### New Approach

This constitutes a new and rational approach to improvement in antityphoid immunization, Landy asserted. Instances where specific antigenic components have replaced whole organisms are rare; in enteric species we have no such examples, he commented. The present study, therefore, probably represents the first instance of the use of these isolated antigenic compounds in man, he said.

Still to be determined, he emphasized, is whether a combination of isolated antigens shown to be superior to existing vaccines in inducing high levels of antibody will likewise be a more effective means of attaining a high degree of protection against natural infection.

### Experimental Evidence

Groups of subjects receiving the bacterial vaccines were given three 0.5 ml. subcutaneous injections of the standard heat-phenol vaccine or the acetone-dehydrated vaccine at weekly intervals and bled 28 and 42 days following the initial injection, he said. The isolated antigens were administered in a single subcutaneous injection containing 20 micrograms of O and 40 micrograms of Vi, and bleedings were taken 21 and 42 days later, he reported.

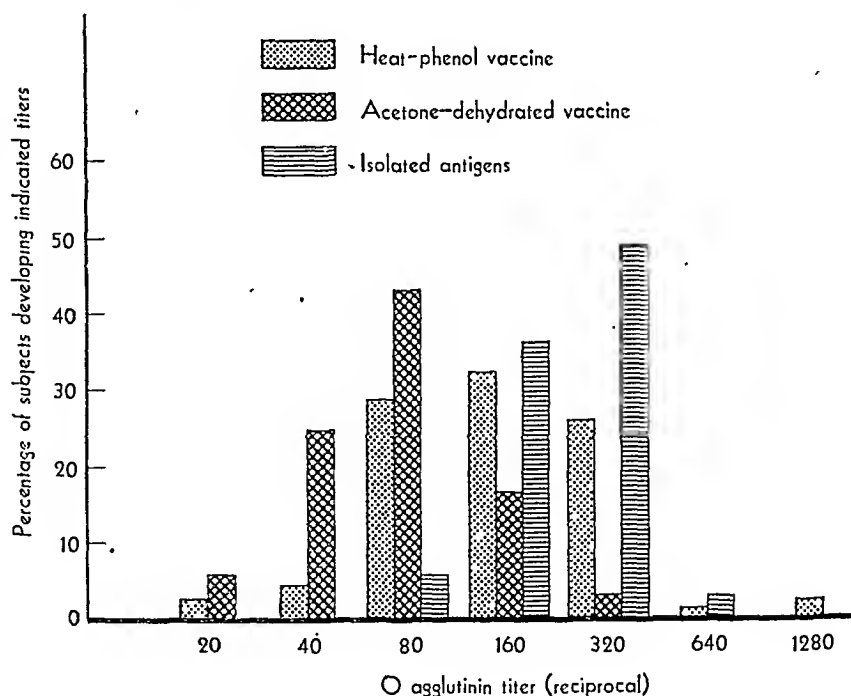
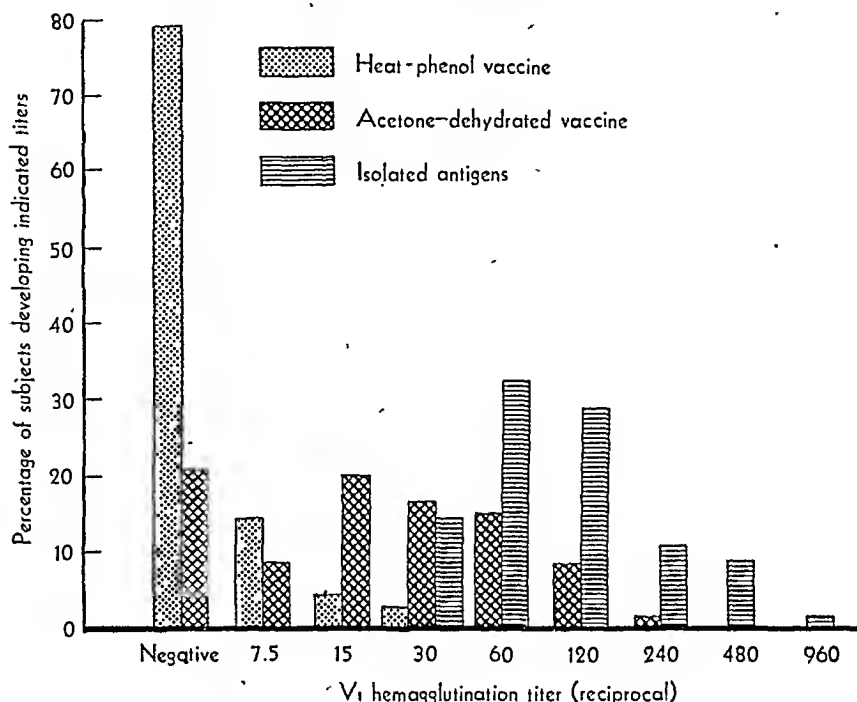
Individuals having a history of previous immunization with standard heat-phenol vaccine, and who showed preimmunization levels of antibody, responded to inoculation in a manner not significantly different from subjects with no such history or antibody levels, Landy said.

All three types of agents tested engendered acceptable O antibody responses in essentially all subjects, regardless of product received, he said.

The acetone-dehydrated vaccine yielded the least, while the isolated O antigen gave the best O antibody levels, he explained (see figure).

With respect to Vi responses, Lan-

**Comparison of Vi (top) and O (bottom) antibody response to three types of antityphoid immunizing agents.**



dy reported, low antibody levels (1:7.5 to 1:30) were obtained in 20 percent of the subjects receiving the heat-phenol vaccine, while 75 percent of the subjects inoculated with the acetone-dehydrated vaccine developed titers ranging up to 1:240.

The isolated Vi antigen, however, resulted in 100-percent antibody response, and the titers developed were by far the greatest, reaching as high as 1:960, he asserted (see figure).

## Effective Immunity Seen Against Typhus Infection

Experience with an avirulent strain of *Rickettsia prowazekii*, reviewed by John P. Fox, M.D., M.P.H., professor of epidemiology at Tulane University, promises to furnish a vaccine against epidemic typhus.

It appears to require but one inoculation to confer effective and relatively durable immunity in contrast to two or more primary doses and booster shots when typhus vaccines prepared from killed organisms are used, he said. Its advantages will protect military personnel and others when louse control is not effective, he added.

### Strain E Found

There have been numerous attempts to immunize man against epidemic typhus by means of living rickettsiae. Vaccinations of this type usually resulted either in no infection and no immunity or in infection associated with unmodified and sometimes fatal disease, he commented.

For this reason, Fox stated, in 1946 Sadusk and Kahlenbeck recommended that living rickettsiae should not be employed for immunization until a strain of demonstrated low pathogenicity for man becomes available.

Fox brought out the following salient points:

In 1943, Clavero and Perez Galardo reported the chance evolution

in embryo passage of a strain of *R. prowazekii* of apparently reduced virulence for experimental animals. This was strain E.

Beginning in 1951 and continuing into 1952, 154 volunteers were given living strain E rickettsiae in varying amounts and by different routes, and an additional 50 volunteers received placebo material or, for comparative purposes, commercially prepared Cox-type vaccine.

Initial interest, of course, centered about the basic safety of strain E for man and the frequency and severity of reactions. Severity and frequency were indicated as directly related to the number of rickettsiae inoculated, but no reactions observed were sufficiently severe to discourage further use of strain E.

It seemed clear that the minimum infecting dose of strain E for man is on the order of 4 log E.I.D.

### Study at Parchman

In the work at Parchman, Miss, infecting doses of approximately 4, 5, 6, and 7 log E.I.D. were given by one or another of several routes. There is a direct relation between size of inoculum and maximum level of CF antibody developed within 2 months after inoculation. The relation of immune response to route of inoculation was less uniform. The conclusion reached was that, while intradermal inoculation yielded better results than the subcutaneous route, intramuscular inoculation should be studied further.

Observations as to the duration of serologic immunity, extended over a period of 2 years, are based entirely on the Parchman group. The biggest drop in CF antibody occurred in the interval between 6 and 12 months. The proportion losing detectable CF antibody was greatest in those given smaller inoculums of strain E.

Tests of the actual effectiveness of the immunity in protecting against disease were made by deliberately challenging small groups of volunteers with virulent *R. prowazekii*. No significant clinical dis-

ease followed challenge of these men, even when challenge was given 24 months after strain E infection.

As judged on serologic grounds, immunity induced by strain E will not prove to be uniformly of indefinite duration, and, hence, is not fully comparable to that following natural infection. However, effective resistance to virulent challenge appears to endure for at least 2 years. Also, strain E vaccine seems markedly superior to Cox-type vaccine in point of uniformity of serologic response, of duration of serologic immunity, and of effectiveness in preventing disease after challenge.

### Trials in Peru

Extended field trials of strain E vaccine were initiated in Peru in October of 1953.

Vaccinated and inoculated control populations, to number ultimately upwards of 10,000 persons each, are being kept under continuous surveillance in selected parts of the mountainous areas of Peru. With approximately 8,500 persons of all ages vaccinated with strain E as a part of this study, no instance of alarming postvaccination reaction has been reported. Insufficient time has elapsed for significant typhus morbidity data to accumulate.

Successful field use in Peru would seem to dispose of the problem of practicability of application. The most important conditions of successful use probably relate to maintaining the viability of the strain E rickettsiae, both during storage of the lyophilized material and after it has been rehydrated.

A final point worthy of consideration is that of the nature of the interaction between strain E rickettsiae and man. The failure to recover the agent from the blood of infected persons and the direct relation between size of infecting dose and level of sero-immune response are reminiscent of earlier observations as to the behavior of strain E in the guinea pig and suggest that in man also it undergoes little or no multiplication.

A vaccine requiring but one inoculation and producing an effective and long-lasting immunity has obvious advantages for use in military personnel during war and in civilian populations at all times when louse control measures cannot be relied upon or effectively applied.

## Varying Booster Responses To Antigens Described

Studies at Letchworth Village in New York State reemphasize the variations in response to reinoculation with different types of antigens, according to the report by Morris Siegel, M.D., M.P.H., associate professor, College of Medicine, State University of New York. These variations, he noted, are important in planning and carrying out effective immunization programs.

Summarizing the pertinent findings, Siegel stated that:

1. An accelerated and very marked increase in circulating antibodies was seen after reinoculation with tetanus toxoid (see chart).

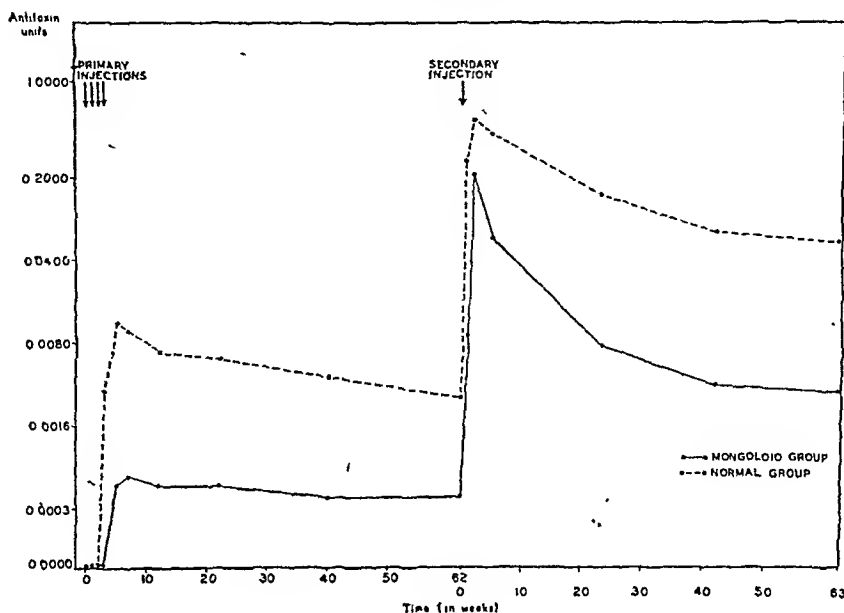
2. An accelerated but somewhat less marked reaction was observed following reinoculation with typhoid vaccine.

3. No increase in antibodies could be detected following reinoculation with pneumococcal polysaccharides until many years after the primary inoculation, when the circulating antibody content of the blood stream was very low or nil.

For the studies of tetanus toxoid and typhoid vaccine, he explained, two groups of 20 male patients each were used, one group having mongoloid characteristics and the other "normal." Two series of subcutaneous inoculations of each antigen were given, the first consisting of 4 weekly doses and the second, 11 months later, a single dose. The period of observation was 33 months.

The rapid secondary response to a single injection of tetanus toxoid

## Primary and secondary antibody response to tetanus toxoid.



many years after primary inoculation seems to preclude the necessity of administering antitoxin following minor injury or of repeating an entire series of inoculations, Siegel pointed out in discussing the practical value of the findings of these and other studies.

Under ordinary circumstances, he said, immunity can be maintained at high level by a small booster dose.

He noted, however, that because the secondary response to typhoid vaccine is less marked and less prolonged, the amount of antigen for reinoculation should be larger and reinoculation should be repeated more frequently.

Thus, he stated, reinjection has been recommended every 2 or 3 years under ordinary conditions or every year in epidemic or highly endemic areas.

## Host Factors

Variations in secondary response related to host factors were also observed in the tetanus toxoid and typhoid vaccine studies, Siegel indicated. Individual differences, he said, were detectable with each anti-

An individual's secondary reaction pattern to a specific antigen appeared to be reproducible by the use of a single dose, he noted further, but there seemed to be little relationship between an individual's responsiveness to one antigen and his responsiveness to another.

Siegel also reported that regardless of antigen, the mongoloid patients as a group showed lower antibody content in the blood stream than the nonmongoloid patients.

He stressed the fact, however, that even in the mongoloid group, the response to reinoculation was accelerated.

## Georgia Rabies Decline Follows Dog Immunization

A rabies epidemic in 1946 covered approximately two-thirds of the State of Georgia but declined abruptly after mass immunization of dogs with living attenuated virus vaccine, according to Leland E. Starr, D.V.M., P.D., public health veterinarian, Georgia State Department of Public Health.

In 1954, only 61 dogs were found to have rabies during the months of January to August, he reported.

He compared this figure with 179 positive reactions during the same period in 1953 and noted that the downward trend continued in 1954. Only 3 infectious in dogs were reported in July 1954 and 2 in August.

In 1946 at the height of the epidemic, there were 765 positive reactions from dogs, foxes, and other animals. This figure, Starr continued, probably represents only a fraction of the total number of infections. In the same year, he said, 3 persons died of rabies, and 1,735 were treated.

## New Vaccine

Mass immunization of dogs has been one of the main objectives of the control program initiated by the Georgia Rabies Act of 1945. This problem, Starr said, has been greatly simplified by the introduction of a live virus vaccine which apparently confers an immunity lasting for several years.

The killed virus brain tissue vaccine, he explained, conferred a relatively weak immunity and made annual revaccination necessary.

Dog owners disliked both the repetition of the immunization procedure and the abscess or paralysis reaction which occasionally followed it. It was found, Starr continued, that, whenever the incidence of rabies in a community was at a low level, interest in immunization could not be maintained. Reimmunization is not being advocated for dogs which received the attenuated virus vaccine, and the product appears to be free of material which might produce severe allergic reactions.

Starr said that mass immunization programs were conducted in 44 counties during 1952, 1953, and 1954. Living attenuated virus vaccine was employed in all but one of the county projects.

Since 1952, he reported, only one proved case of rabies has occurred in a dog inoculated with the new vaccine.

## Fox Rabies

Rabies among the enormous number of foxes in Georgia's forests and swamplands also declined in 1954, according to Starr.

Thinning of the fox population by means of trapping and the payment

of bounties is another primary goal of the State control program, he said.

Starr does not believe, however, that effective and lasting control can be achieved by a few States. In his opinion, only the coordinating activity of a Federal agency can attain that end.

# Respiratory System Viruses . . .

*The new viruses designated as APC agents are reported as resistant to ether and the antibiotics. Two studies on the RI-67 infections are also reported.*

## Study New APC Viruses From Respiratory Tract

New respiratory system viruses were reported as having been isolated in tissue culture from adenoid and tonsillar tissue removed at surgery and from nasopharyngeal and conjunctival secretions and feces of persons with respiratory illnesses.

The report was made by Robert J. Huebner, M.D., chief of the Virus Section, and Wallace P. Rowe, M.D., medical officer of the National Microbiological Institute, Public Health Service, and Thomas G. Ward, M.D., assistant professor of bacteriology, Johns Hopkins University School of Hygiene and Public Health.

The new viruses are designated as adenoidal - pharyngeal - conjunctival (APC) agents, indicating the important anatomic sites in which they are found. One hundred forty-three strains of virus have been segregated into six immunological types, and additional types probably exist, they said in reporting that:

All types grow readily, producing similar and unique cytopathogenic effects in human epithelial cells and in HeLa cells available commercially. They are resistant to ether and anti-

biotics. In humans and in rabbits, the viruses produce potent type-specific neutralizing antibodies and lesser amounts of heterotypic responses to other types. Complement-fixing antigens and antibodies produced in comparatively large amounts are group specific but not type specific to about the same extent for all six types.

All six types produce frequent infections in man, beginning at an early age. Serologic surveys in the Washington, D. C., area indicate that 50 percent of infants 6 months to 1 year of age have been infected with at least 1 type. By age 15, the average person has had infections with several types, and by age 34, most persons appear to have had infections with 4 or more types. A few persons were found to have antibodies against all 6 types.

## APC Virus Evidence

Intensive investigations are now going on to determine the incidence, prevalence, and specific kind of illnesses produced by these virus infections. Evidence indicates that the viruses of types 3 and 4 cause specific respiratory illnesses. Type 3 has been recovered from numerous cases of acute nasopharyngitis and con-

junctivitis occurring during a winter outbreak on a hospital ward and a summer outbreak in a country day school. Type 4 (Hilleman and Werner's RI-67 agent) apparently produced respiratory illnesses in military personnel described as ARD, primary atypical pneumonia, and acute febrile pharyngitis. Viruses of types 1 and 5 have also been found in cases of acute pharyngitis, but more evidence is needed to establish the role of these and other types in human disease.

A suggested hypothesis is that the APC viruses have a possible role in persistent chronic disease of tonsils and adenoids (and their enlargement). This is based on demonstrations of viruses of 43 strains, classified in 5 immunological types, obtained from persons undergoing tonsillectomy-adenoidectomy and subsequently grown in tissue culture. Possibly more important is the demonstration of viruses in tissues also containing specific antibody against it by the simple expedient of growing such tissues for prolonged periods. This method of "unmasking" viruses represents a highly sensitive and essentially new technique for isolating viruses.

## Virus RI-67 Infection Linked to ARD

Studies of respiratory disease epidemics at a number of military bases in the United States revealed widespread infection, especially among recruits in basic training centers, with the recently discovered RI-67 virus group, according to the report of a team headed by M. R. Hilleman, Ph.D., assistant chief, Department of Virus and Rickettsial Diseases, Army Medical Service Graduate School, Washington, D. C.

The other investigators were Capt. H. E. Dascomb, MC, USA, Lt. R. L. Butler, MC, USA, Capt. J. J. McCue, MC, USA, Capt. R. Stragnell, MC, USA, and J. H. Werner.

During the past year, one investigation, based on serum tests, showed that 77 percent of the men in a newly recruited company at Fort Dix, N.J., were infected with members of the RI-67 group of viruses in the first 8 weeks of training, they announced.

About a quarter of the infected men developed illnesses severe enough to require hospitalization. Dispensary treatment was sufficient for another 25 percent of the cases, and half the men apparently suffered very mild or inapparent infections.

The hospitalized patients had illnesses which the Army team said have been called by such names as catarrhal fever, gripe, and virus pneumonia.

Hilleman and his associates claimed that the diseases resulting from RI-67 group infections fit into two clinical entities whose causative agents had not previously been cultivated in the laboratory.

The entities were described as undifferentiated acute respiratory disease, commonly called ARD, and primary atypical pneumonia of the kind in which the test for cold agglutinins of red blood cells remains negative.

### Summer Illness

According to the Army investigators, diseases caused by virus RI-67 occur during the warm months of the year as well as in the cold season.

This was said to be in striking contrast to influenza which is common in winter, late autumn, and early spring but quite rare in summer.

A serologic survey taken to determine the extent of previous experience with RI-67 group viruses in the normal human population revealed that a majority of people have had past experience with these agents.

Infection appears to occur most often during the middle years of life, and to be comparatively rare among younger and older people, according to Hilleman and his co-workers.

Virus strains of the RI-67 group were reported to exhibit antigenic

differences which are readily detectable in neutralization tests carried out in tissue culture with serums from human patients with ARD or primary atypical pneumonia. All these viruses, however, elaborated a soluble antigen, common to the entire virus group, which was detectable by the complement fixation test.

The investigators said that these facts made the neutralization test necessary for strain typing and the complement fixation test more suitable for diagnosis.

The Army scientists said that the RI-67 group of viruses are related to the family of latent adenoid and tonsil degenerative viruses discovered in 1953 by Drs. Wallace P. Rowe and Robert J. Hnebner, of the National Microbiological Institute, Public Health Service, and others.

## Clinical Syndromes Related To New Virus Groups

Determination of the causative agents of certain acute respiratory diseases has opened the way to the study and discovery of the causes of still others, Harold S. Ginsberg, M.D., and his associates reported.

Associated with Dr. Ginsberg in this study of serums from human transmission and clinical cases were: Eli Gold, M.D., William S. Jordan, Jr., M.D., Sidney Katz, M.D., George F. Badger, M.D., and John H. Dingle, M.D., all with the department of preventive medicine of the School of Medicine of Western Reserve University.

The RI-67 agent has been indicated, they said, to be the cause of a grippelike illness called febrile catarrh, or because of its World War II frequency in military populations, "acute respiratory disease of recruits," or ARD. A viral pneumonia may be part of ARD and caused by the same agent, they said. Acute nonstreptococcal pharyngitis, so-called summer sore throat, has been



demonstrated to be caused by at least two of the "adenoid degeneration" (AD) viruses, they said.

Between the relatively mild common cold and the severe primary atypical pneumonia are two infections—ARD and nonstreptococcal exudative pharyngitis. Their exact identification depends upon the recognition of the etiological agent of each, Ginsberg and his co-workers believe. Their study focused on these two infections.

Ginsberg and his associates stated:

1. The agent which produced ARD in previous human transmission experiments was identical with or immunologically closely related to the RI-67 virus isolated by Hilleman and Werner.

2. Susceptibility to infection from this agent was correlated with the absence of specific neutralizing antibodies.

3. Conversely, some resistance to infection was observed in volunteers whose blood contained specific neutralizing antibodies at the time of artificial infection.

4. The RI-67 or related agent did not induce primary atypical pneumonia of the type characterized by development of cold hemagglutinins or the common cold in volunteers.

The report suggested that the agent that causes the grippelike infection be called the ARD virus, but they did not want their findings to imply that the RI-67 agent is the only virus which may cause ARD. On the other hand, they said, the data clearly indicate that more than one agent is responsible for this clinical syndrome.

## AD and the RI-67 Agent

Little difference could be demonstrated between the RI-67 agent and the AD type 2 agent when complement fixation titrations were done, Ginsberg and his associates said. The AD agent appears not to be implicated etiologically with the classical forms of ARD or with primary atypical pneumonia, but the evidence

indicates that the type 3 agent is related to nonstreptococcal pharyngitis, and that other agents, one of which is a type 2-like virus, they said, may initiate the disease. They think that in a single, relatively sharp epidemic, more than one agent

may be active; and that neutralization titrations are essential.

One of their findings was that complement fixation titrations cannot be employed to relate the specific etiology of an acute respiratory disease to the RI-67 or AD agents.

## Poliomyelitis . . .

*Looking to this spring for the report on the Salk vaccine . . . Studying the growth of the virus in the cotton rat fetus.*

### Poliomyelitis Virus Grown In Cotton Rat Fetus

A new experimental animal, the cotton rat fetus, may now be used to produce and to study type 2 poliomyelitis virus, according to Fred W. Gallagher, Ph.D., department of bacteriology and preventive medicine, University of Vermont College of Medicine.

One of the advantages found in using the fetal brain to propagate type 2 virus is the high concentration of virus produced, he reported.

This high concentration and the large number of fetuses in a single litter makes possible substantial yields of virus material from one pregnant rat, he commented, and this should interest scientists producing virus for antigen in the complement fixation test or for the production of vaccine.

Other advantages Gallagher reported are:

Vaccine made from fetal brain tissue does not produce an encephalomyelitis as adult mouse brain tissue vaccine may when injected into monkeys.

Small quantities of virus in the inoculum suffice to grow large quantities of virus in the fetus. Thus, the fetus might prove to be a delicate

test animal for control use on the inactivation of virus, or for primary isolation of virus from clinical material. Since the virus does not pass from fetus to fetus, several tests may be conducted simultaneously in a single pregnant cotton rat.

### Method and Results

Following Woolpert's technique for injecting fetuses, 21-day pregnant cotton rats were used, he said.

The gestation period of the cotton rat is 26 days, and 21-day-old fetuses are large enough for accurate inoculation and yet allow for an incubation period of 4 days, he explained.

In a few cases incubation periods of 2 and 3 days were used, but results were poor, he commented.

Three strains of type 2 virus were used in the experiments, he stated, although most of the work was done with a strain of Lansing virus obtained through the American Type Culture Collection. The other two strains were a Lansing type maintained at the school laboratory for many years by mouse brain passage, and an M.E.F.<sub>1</sub> virus.

Three routes of inoculation were employed, intracerebral, and the thoracic and abdominal cavities, he continued, but the intracerebral route proved best.

In comparative titrations, fetal



brain material was found to contain virus about 100 times as concentrated as the same strain grown on adult mouse brain, Gallagher reported.

Success in the propagation of type 2 poliomyelitis virus in the cotton rat fetus suggests the possibility of growing type 1 and type 3 virus if the right host is found, Gallagher asserted.

Preliminary tests, he added, have indicated that type 1 virus will grow in fetal hamsters.

The poliomyelitis vaccine evaluation center at Ann Arbor is under the direction of Dr. Thomas Francis, Jr.,

chairman of the department of epidemiology at the University of Michigan.

## Tuberculosis Research . . .

*Laboratory studies of the virulence of isoniazid-resistant tubercle bacilli are reported in the two papers in this section.*

### Report on Salk Vaccine To Be Made Soon

A report on the effectiveness of the Salk poliomyelitis vaccine may be made in the spring of 1955, according to Robert F. Korns, M.D., deputy director of the poliomyelitis vaccine evaluation center at the University of Michigan.

Korns, who is on leave from his post as director of epidemiology and communicable disease control for the New York State Department of Health, reported that 27 research laboratories and 1,800,000 children are participating in the program to evaluate the vaccine. Funds from the National Foundation for Infantile Paralysis are supporting the study.

In addition to painstaking tests concerning children who contract poliomyelitis, blood tests are being performed on samples collected on three occasions from approximately 40,000 other children in the field trial study group.

About 435,000 children in 217 areas of the country have received one or more injections of the vaccine developed by Dr. Jonas E. Salk and his associates at the University of Pittsburgh under National Foundation grants. Another 210,500 have received one or more injections of a placebo. More than 1,175,000 additional youngsters received no injections, but are participating in the vaccine field trial by serving as a control group.

### Report Isoniazid Effects On Tubercle Bacilli

Confirming some findings in recent literature, Robert A. Patnode, Ph.D., and his associates, Martha C. Dail and Paul C. Hudgins, reported that strains of tubercle bacilli isolated from isoniazid-treated patients were found to be less virulent for guinea pigs than typically virulent H37Rv strain. However, they found no correlation between the reduction of virulence and the degree of resistance to the drug in vitro.

Dr. Patnode and Mr. Hudgins are with the Washington (D. C.) Veterans Administration Hospital and Miss Dail is at the Army Medical Service Graduate School of the Walter Reed Army Medical Center. They used 13 cultures from resected necrotic lesions of patients who had received long-term isoniazid therapy (6 months or longer). Dr. Patnode and his associates found the organisms did not differ from the H37Rv strain (used as a control) in their ability to bind neutral red and to form cords or in their ability to decolorize certain oxidation-reduction dyes.

The results of these growth studies, they said, seem to indicate that the organisms have not lost their virulence for guinea pigs solely by virtue of having acquired a special growth requirement for a substance not available in normal guinea pig tissue.

The study, they said, seems to indi-

cate that the altered growth characteristics in vitro and the reduced virulence for guinea pigs are not necessarily based on the same mechanism.

In this experiment, guinea pigs weighing on the average 225 grams were inoculated subcutaneously in the right inguinal region with 0.5 ml. (1.5 mg.) of 15-day-old cultures of the test organisms. Tween albumin medium containing a concentration of isoniazid lower than the minimal inhibiting concentration was used.

### Tubercle Bacilli Resistance To Isoniazid Needs Study

The virulence of isoniazid-resistant tubercle bacilli in human beings is still in doubt, although some correlation exists between development of resistant organisms and lack of improvement of patients when isoniazid therapy is continued, reported Daniel Widelock, Ph.D., assistant director, Lenore R. Peizer, senior bacteriologist, and Sarah Klein, bacteriologist of the bureau of laboratories, New York City Department of Health.

Results of laboratory experiments to determine the extent of the risk involved in the spread of isoniazid-resistant tubercle bacilli by unhospitalized patients and the extent to which these organisms are responsible for the maintenance and spread

of active lesions in individual patients accentuated this doubt, Widelock and his co-workers said.

They found that isoniazid-resistant tubercle bacilli played little, if any, part in the formation of tubercles in either guinea pigs or mice when the animals were injected with mixtures of isoniazid-resistant and isoniazid-sensitive organisms. However, the resistant organisms multiplied and produced tuberculous lesions in the lungs, spleen, and liver of guinea pigs with concomitant enteritis. Also, when grown in a drug-free medium, isoniazid-resistant organisms became isoniazid-sensitive in vitro, and when resistant organisms were found in a patient, bacteriological findings became worse.

#### *Further Studies Needed*

Widelock and his colleagues said that possibly resistant organisms have no part in the maintenance and

spread of tuberculous lesions in human beings. They suggested that sensitive or only partially resistant organisms may produce the lesions but may not be eliminated by the drug, and that they may multiply as sensitive organisms and maintain the active disease. Resistant organisms, which play no part in the formation of new lesions, may be produced at the same time.

Further study is needed, they stated, to determine the virulence or avirulence of isoniazid-resistant tubercle bacilli. This requires a correlation between clinical findings and a quantitative study of resistant and sensitive tubercle bacilli in the sputum of patients. Widelock and his co-workers are attempting to do this by a quantitative catalase test, considered valuable in the rapid determination of the percentage of resistant and sensitive tubercle bacilli in cultures.

mously when there is actually a significant difference in their meaning.

#### *Common Definitions*

McKevitt cited an article in which the terms "performance budget," "functional budget," and "program budget" were all used, apparently interchangeably. "Performance," "functional," and "program" are not pure synonyms in everyday English, he said, although some writers use them synonymously. To question the usage of such elementary terms may seem petty, he stated; nevertheless, "the practical aspects of common definitions should be insisted upon."

According to McKevitt, performance budgeting demands coordination between budgeting, accounting, and reporting. These are general accounting terms which may have to be adapted somewhat if they are to meet the requirements of performance budgeting.

Standardizing definitions is a major accomplishment in any discipline, McKevitt stated. Performance budgeting is comparatively new, and experience will be necessary before refined definitions can be worked out. Several organizations are interested in the problem, and several reports of studies on budgeting and accounting terminology are available or in preparation.

"However," concluded McKevitt, "if we are to reduce the influence of chance in the development of a vocabulary for performance budgeting, we must all be aware of the importance of cooperating in the efforts to develop such a vocabulary systematically."

## Business Management . . .

*Standardization of the key terms used for public health budgeting is urged, and the use of the fixed-variable technique in controlling public health program costs is explained. Health department savings may be accomplished in a number of ways—one department replaces old automobiles with a pool of leased cars.*

### **Program Budgeting Terms Need Standardization**

A happy nomenclature may have more influence than rigorous logic on the acceptance of a new idea, and proper association of words and meanings may be a key factor in the development of understanding of the basic concepts and methods of program or performance budgeting, stated John G. McKevitt, M.P.A., director, administrative services divi-

sion, Michigan Department of Health.

Budget terms and meanings are borrowed from various sources, such as accounting, political science, law, statistics, and taxation, and, in public health programs, from the specialized vocabulary of public health, McKevitt continued. He said that, although most of these terms are well defined and well understood, many are peculiar to program budgeting. Some terms are synonymous, but others are used synony-

### **Fixed-Variable Technique Tests Costs Behavior**

The fixed-variable approach to cost control, a technique being used in industry, is a valuable supplement to sound planning and intelligent control of the cost of public health programs, said Wilson T. Seney, B.A.,

a management consultant, New York City.

Seney defined fixed costs as those incurred in order to be ready and able to do work; variable costs, as those incurred only when work is done. For example, the salary of a roentgenologist is a fixed cost, he said, and the cost of X-ray film varies with the number of examinations made. Fixed costs, he explained, are committed in advance of accomplishing a defined program, whereas variable costs, in contrast, are much more controllable, as they are not incurred until the work is done.

Relating costs to the reasons why they are incurred is the best way to deal with them, Seney said. For example, in a public health agency, the only reason for incurring costs is to achieve some definite result, he maintained. Costs, therefore, should be related to the amount of work done or to the results achieved. Some costs are 100 percent fixed, some are 100 percent variable, and others fall somewhere between these two classifications.

Seney claimed that the fixed-variable technique carries basic budgeting costs to their logical conclusion and helps to plan expenditures in advance and to see that they are used efficiently.

According to Seney, sound cost control means long-range planning, program budgeting, comprehensive budgeting of all costs for each program, techniques to estimate the costs of different methods of doing each job, and individual responsibility for certain costs.

### *Planning and Performance*

Study of the fixed and the variable costs of two proposed programs of equal merit will provide valuable information which cannot be obtained in any other way and which will help in deciding which program is the more desirable from the standpoint of cost, Seney continued. Such a study helps in long-range financial planning; it indicates the cost of a program in more meaningful terms, and it makes possible comprehensive

statements which account for all factors of cost.

Better performance reports are possible with the fixed-variable method of budgeting, Seney said. In a hospital, for example, it is essential to successful performance budgeting that the director be expected to control fixed costs only in terms of living within the fixed cost allowances, but he should be made accountable for variances from the budget allowance for variable costs.

### **Can't Buy New Cars? Wyoming Leases Them**

A new plan providing for leasing arrangements of acceptable and safe transportation was described by Hale Laybourn, administrative officer of the Wyoming State Department of Public Health. The department studied the plan when cut appropriations did not provide enough funds for replacement of old vehicles, Laybourn told his hearers.

The agreement for leasing cars was entered into with a Wyoming firm, after bid proposals. It covers oil changes, lubrication, maintenance, repairs, tuneups, tire replacements, license plates, and 15,000 miles per year for 2 years at a monthly rate of \$65 per unit, with an additional charge of 1 cent per mile for all mileage beyond the set amount. At the present time 11 automobiles are provided by the lease arrangement.

Laybourn stated the average cost per automobile unit since the plan went into effect in September 1953 was 6 cents per mile.

### *Fleet Rates*

The department, Laybourn said, contracted for its own insurance at fleet rates, approximately \$65 per unit per year. Gasoline purchased from State-owned highway garages costs about 20 cents per gallon. An attractive feature of the leased car plan, Laybourn stated, is the personal mileage allowance of one-third

of the 15,000 miles annual allowance to the employee. The driver is charged a flat rate of \$20 per month, \$2.25 per month for insurance and actual cost for all accessories, and 1 cent per mile for all miles driven in excess of the allowed 5,000 miles per year.

### *Pros and Cons*

Laybourn listed these advantages to the State: (1) eliminates the not always successful pool system or assignment of State-owned cars; (2) avoids the need for original capital outlay required in purchasing new cars; (3) eliminates some records, vouchers and purchase orders because maintenance, oil change, lubrication, and tire replacement are shifted to the lessor; (4) obtains safe and good operating vehicles every 2 years; (5) and obtains for the employee economical personal transportation—\$25 to \$35 per month—and for the department, economical transportation costs at approximately 6 cents per mile. Employee morale is improved.

The disadvantages, Laybourn said, include additional auditing and record maintenance to insure that the costs to the department and the miles driven on business are equitable, within the legal limit, and fairly charged.

### *Problems Remaining*

Some problems that remain to be resolved, the administrator thinks, are: (1) Is it better to prorate the charges for personal mileage on a monthly rate or on a mileage rate? (2) Should a different insurance coverage for collision be considered? (3) Can a better arrangement for oil changes, lubrication, and maintenance be applied?

### **Kansas Estimates Savings From Health Activities**

State and local public health activities can be dramatically justified from an economic viewpoint in the

opinion of four members of the Kansas State Board of Health.

Reporting on a study which estimated the savings accomplished by the board were Thomas R. Hood, M.D., M.P.H., executive secretary; Russell L. Culp, M.P.H., chief of the water resources section; Charles A. Hunter, Ph.D., director of public health laboratories; and Bertha H. Campbell, director of health information services.

It is important to the consumer to know whether public funds are purchasing something of value and what return may be expected from the investment, Hood and his colleagues said.

They discussed two methods of approach to compiling data on the economic value of public health services—the calculation of actual savings brought about by public health programs and comparing the cost of a service provided by a government agency with the cost of the same service purchased from private enterprise.

### *Estimating Savings*

Savings may be calculated in several ways, Hood and his colleagues said. Among these are comparison of annual costs of particular diseases over a period of time; listing the cost of judgments against local governments for disease and death following outbreaks of preventable disease; and calculation of the financial savings in insurance claims following a program of health education, early diagnosis, and nursing service among policyholders.

As an example of the economic value of public health activities, they stated that in Kansas, installation of public sewers in new homes simultaneously with construction has resulted in an estimated annual saving of \$2 million in three counties alone.

Another example of the economic value of the contribution of the sanitation division is the \$4.7 million saving resulting from the recovery annually of 1.8 million barrels of oil from waste oil brine.

Hood and his co-workers cited as

other sources of savings through public health programs: control of waterborne diseases; consultation services to cities, schools, and individuals on matters of water supply, sewage and waste disposal, insect and rodent control, general sanitation, and other domestic and municipal problems; review by engineers of the sanitation division of reports, plans, and specifications submitted by consulting engineers; control of corrosion of water mains and storage reservoirs; control of water pollution; and reclamation of waste products from water.

## Venereal Disease Studies . . .

*Laboratory examination is the only completely reliable method of confirming gonorrhea, one that will protect the patient and the physician and at the same time be acceptable from a medico-legal standpoint. The reliability of analogies between experimental syphilis in animals and infections in man has been demonstrated in a study of inoculation syphilis at New York's Sing Sing Prison.*

### **Urges Lab Confirmation Of Gonorrhea Diagnosis**

With the increase in reported cases of gonorrhea, it is important to know what diagnostic method has been used as a basis for a positive report to the health department, according to Lt. Col. Paul S. Parrino, Capt. Edward J. O'Shaughnessy, and Lt. John D. White. Health departments should insist that the method of diagnosis be stated on all reports of cases of gonorrhea, they said.

Colonel Parrino is preventive medicine officer, United States Army Hospital, Camp Kilmer, N. J.; Captain O'Shaughnessy is urologist and Lieutenant White is research bacteriologist with the genitourinary research project at the hospital.

Information regarding the method of diagnosis has become particularly important during the last 2 or 3 years, they continued, since reports on studies of nongonococcal urethritis in the male indicate that many cases have been erroneously treated as

gonorrhea because of unreliable diagnostic methods. They stressed the importance of uniform diagnostic methods and recommended the universal adoption of the methods described in the American Public Health Association manual, "Diagnostic Procedures and Reagents."

Sufficient funds should be made available to staff all health department laboratories with technicians well trained in the procedures for diagnosing gonorrhea, they stated.

Of the four methods for diagnosing gonorrhea—laboratory, clinical, therapeutic, and epidemiological—only laboratory procedures can be relied upon completely, they asserted, and from the medico-legal standpoint, "complete identification of the gonococcus by cultural techniques is the only method that is acceptable." It is the only one that will protect both patient and physician, Parrino and his co-workers said.

If reliable laboratory services are not immediately available, diagnosis can be made from history and physical examination, but "reliance upon

clinical evidence introduces a very large error," they reported. However, in a high percentage of cases in the male, a correct diagnosis can be made on the basis of differences in length of incubation period, predominant symptom, and character of discharge in gonococcal and in non-gonococcal infections.

Diagnosis can also be made on the basis of therapeutic response to penicillin, Parrino and his co-workers stated, but the large proportion of cases of nongonococcal urethritis reported to have been diagnosed originally as gonorrhea but which were not cured by penicillin "is further evidence for more efficient application of recommended laboratory procedures." Also, large doses of penicillin administered to cases diagnosed as gonorrhea without adequate laboratory procedures will contribute to the development of penicillin-resistant organisms, they pointed out.

demonstrates the reliability of analogies between experimental syphilis in rabbits and infections in human beings. In the past, any such analogies were subject to question because of the differences between the two species.

### *Post-Treatment Infection*

That reinfection is possible following curative treatment for syphilis was one of the conclusions reached. The study showed that after treatment for early syphilis, reinfection is accompanied by new early syphilis type lesions. Following treatment for late syphilis, some individuals may become reinfected, with development of lesions which, in some cases, were gummatous in nature.

Some of the study group who had been previously treated for latent syphilis may have been protected from the experimental infection by

prior injection of a vaccine of killed *Treponema pallidum*.

Data from the study also suggests that time since treatment may have influenced the possibility of experimental infection in those who had originally been treated for latent syphilis, leading to the implication that immunity to reinfection in this group declines with the passage of time.

Thomas and his associates reported that persons who had been recently treated for latent syphilis were less likely to be infected by the experimental inoculation than were those who had been treated 10 or more years prior to the study. Patients who had been treated for early syphilis could be reinfected experimentally no matter how recently they had been treated. Need for further studies in the development of immunity for syphilis was stressed.

## **Sing Sing Syphilis Study Confirms Rabbit Tests**

A 15-month well-controlled investigation of inoculation syphilis in man conducted during 1953-54 at New York's Sing Sing Prison confirms many of the findings gained from animal experiments. The study was made possible by the proved efficacy and safety of penicillin therapy for syphilis and by the cooperation of 62 prison inmates who volunteered for the investigation.

The study was reported by Evan W. Thomas, M.D., Lopo de Mello, M.D., Bernard Kaplan, M.D., John C. Cutler, M.D., Harold Magnuson, M.D., and Sidney Olansky, M.D. Dr. Thomas is epidemiologist and Dr. de Mello is venereal disease consultant, New York State Department of Health; Dr. Kaplan is medical officer of Sing Sing Prison; and Dr. Cutler, Dr. Magnuson, and Dr. Olansky are with the Public Health Service's Venereal Disease Branch.

In general, the Sing Sing study

## **Studies on Brucellosis . . .**

*A safe, effective test for use in epidemiological studies of human brucellosis is suggested. A new laboratory method for diagnosing brucellosis and a growth factor for a Brucella strain difficult to colonize are described. Attempts to eradicate brucellosis in animals are reported.*

### **Iowa Reports on Control Of Animal Brucellosis**

Only the complete eradication of brucellosis in animals will prevent the disease in human beings, declared Stanley L. Hendricks, D.V.M., M.P.H., public health veterinarian, Iowa State Department of Health, Des Moines. In Iowa, he said, brucellosis is the most frequently reported of the animal diseases transmissible to man.

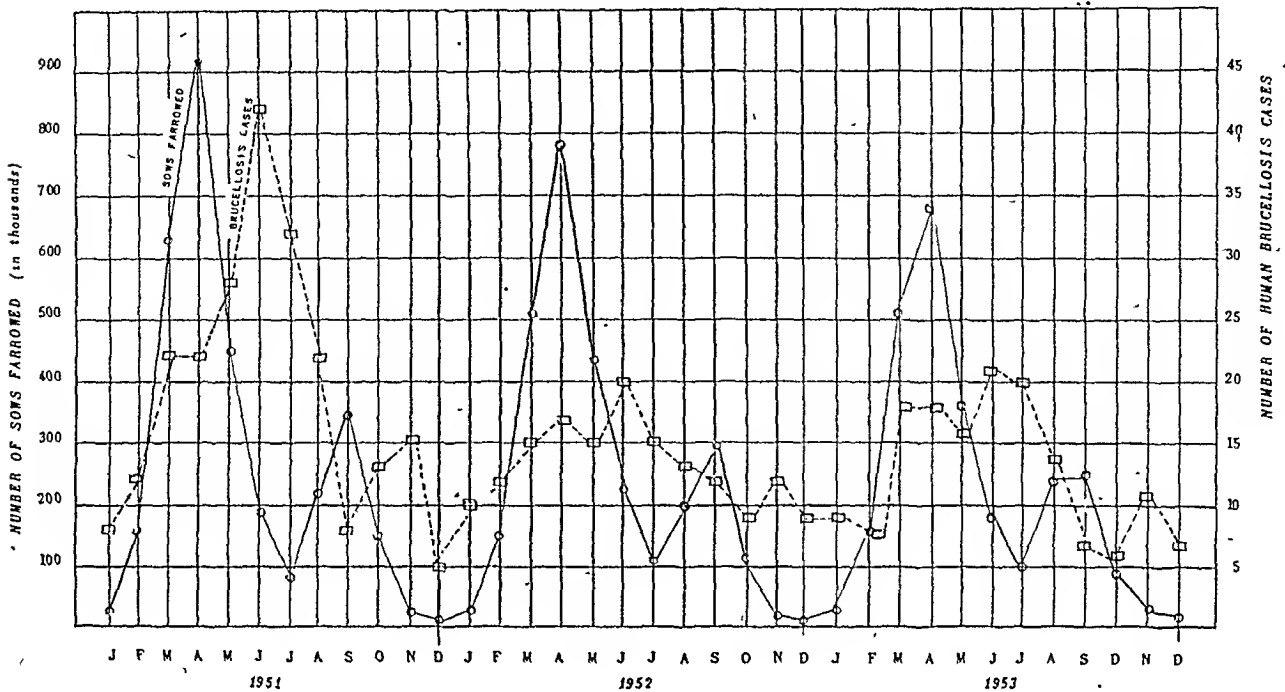
Apparently an increasingly larger

proportion of brucellosis cases result from animal contact and an increasingly smaller number result from drinking contaminated raw milk, Hendricks continued.

Investigations of brucellosis cases in Iowa from the time the first case was reported in 1926 to the end of 1953 also indicate that the skin is important as a portal of entry for *Brucella* organisms, that there is danger of *Brucella* infection when hogs are allowed to mingle with dairy cows, and that *Brucella meli-*

# BRUCELLOSIS

Number of sows farrowed, by month, and reported brucellosis cases among male farm workers, by month of onset, Iowa, 1951-53.



*tensis* occurs in both man and hogs, the veterinarian said.

Hendricks based his report on 2,047 cases of brucellosis reported in Iowa for the 3-year period 1951-53. The cases were scattered throughout the State, he said, but the larger number occurred in counties in which large packinghouses are located.

Of 720 cases for which information on both occupation and sex are available, 51 percent were male farm workers, 22 percent were packinghouse employees, and 10 percent were housewives, he said. More than three-fourths of the housewives lived in rural areas and were exposed to much the same risks as male farm workers. Comparison of the distribution of cases by sex and age indicated that the proportion of male cases is increasing and that in Iowa the majority of cases occur among persons in the 30-49 year age groups.

## Seasonal Occurrence

June, July, and August were the months of highest incidence of bru-

cellosis, Hendricks said. The month of onset varied among persons in several occupations, with the most marked variation among male farm workers; about 2½ times as many reported beginning symptoms in June as in January. The number of brucellosis cases among these workers increased in the spring and fall, following the date of sow farrowing by about 2 months (see chart).

Preceding their illness, 80 percent of the persons in the 1951-53 group of brucellosis patients either came into contact with animals or animal excretions in the course of their regular occupation or had such contact outside of their daily work, he said. In several instances, the cases reported apparently resulted from environmental contact, he reported.

The brucellosis patients drank milk from a number of sources, Hendricks stated. Many farm families have pasteurizing units and some of the farm patients used only pasteurized milk bought from a dairy, but 87 percent of those using milk from their own cows drank it without pasteurization, he said.

Hogs, however, are apparently the principal source of *Brucella* infections in Iowa, according to Hendricks, and the approximately 20 million hogs produced in the State each year make up a large potential reservoir of brucellosis.

Iowa is making progress toward the prevention of brucellosis in human beings through the eradication of brucellosis in animals, Hendricks stated. The milk ring test is being used to screen herds of cattle which may contain infected animals; suspected herds are being blood tested; more calves are being vaccinated, and a program for control of brucellosis in swine has been started, with the objective of developing brucellosis-free breeding herds.

## Urges Intradermal Tests For Brucellosis Surveys

Intradermal tests, using brucellergen, in epidemiological studies on human brucellosis are safe and are more effective than agglutination

tests for detecting inapparent, latent, and chronic infections, according to a California study. Brucellergen is a protein nucleate prepared from *Brucella abortus*, *Brucella suis*, and *Brucella melitensis*.

The study was presented by Charles M. Carpenter, M.D., Clinton E. Tempereau, M.D., Ruth A. Boak, M.D., Thomas Brem, M.D., George M. Leiby, M.D., Benjamin F. Klausmann, M.D., and Frederick W. S. Modern, M.D., of the department of infectious diseases, University of California School of Medicine, and of the Investigative Medicine Service, Long Beach Veterans Administration Hospital.

Chronic brucellosis morbidity has, as yet, not been satisfactorily evaluated because of a lack of dependable diagnostic methods, they declared.

Data on the epidemiology of human brucellosis have been derived chiefly from reports of cases of acute undulant fever from which *Brucella* has been isolated, agglutination tests on blood of chronically ill hospitalized patients, and agglutination tests of blood submitted to public health laboratories for serologic tests for syphilis, they said.

### Intradermal Tests

The dermal sensitivity test for brucellosis has been well-established and resembles the tuberculin test, they declared. The basic problem confronting the investigator, they commented, is the differentiation of immunity from active infection in persons with dermal sensitivity.

Tests for the present study were made by injecting 0.1 ml. of brucellergen intradermally in the forearm and results were read after 48 hours, they said. The authors reported they experienced no difficulty with false-positive reactions or severe reactions from those patients with marked dermal sensitivity.

The results of the present study fell in line with the studies reported in the literature, they commented. Findings reported were: Of 900 hospitalized patients tested, 223, 24.8

percent, reacted positively; 53 well persons of 500 tested, 10.6 percent, were positive; 73 Tahitians, never previously in contact with the infection, all reacted negatively; only 3 of 100 hospitalized children reacted positively.

## Brucellosis Test Method Gives Uniform Results

Microscopic slide and macroscopic tube flocculation tests for brucellosis, which give clear and easily read results, can be performed rapidly and can be reproduced in any laboratory, according to Charles A. Hunter, Ph.D., director, and Bernice L. Christesen, B.S., division of public health laboratories, Kansas State Board of Health.

A newly developed method for coating cholesterol with *Brucella* organisms or extract produces an antigen that can be adjusted to standard sensitivity and specificity, they asserted.

Since the use of cholesterol coated with cardiolipin and lecithin as an antigen has made it possible to standardize serologic tests for syphilis, Hunter and Christesen believe a similar process can produce a standardized test for brucellosis and decrease mistakes in interpretation of titer. They do not believe that the use of one particular strain of *Brucella* will produce an antigen for a standard test.

Antigen emulsions prepared by the new method may be used immediately or for at least 8 days after storage under refrigeration, they said. Microscopic and macroscopic flocculation tests have been compared with agglutination tests using this antigen and their results are easier to read and give a sharper end point than tests generally in use, they reported.

Contrary to recommendations in current agglutination techniques, Hunter and Christesen found that inactivation of the serum at 56° C.

for 30 minutes reduces prezone reaction and produces results which are relatively clear and easily interpreted.

It is doubtful that interpretation of results obtained from agglutination tests can ever be standard, they said. But, they added, flocculation tests, which may be adopted in standard form in any laboratory, using antigen produced by this new method, may eliminate most of the difficulties experienced with present agglutination techniques.

## Growth Factor Found For Fastidious *Brucella*

Discovery of a biochemical agent which promotes the colonial growth of a fastidious *Brucella* strain was reported by I. Forest Huddleson, D.V.M., Ph.D., of the Michigan State College Department of Bacteriology and Public Health. He identified the agent as an albuminous substance or one closely associated with this fraction.

Huddleson, in attempting to find a medium to promote the growth of the CO<sub>2</sub> dependent type II (Wilson) strain *Brucella abortus*, used three agar and liquid media—tryptose, trypticase soy, and peptone M. His experiments revealed that the growth factor is contained either in a completely soluble extract from sonically disintegrated cells of *Brucella suis* or *Micrococcus aureus*. It can survive a heat of 120° C. for 30 minutes.

Demonstration of the factor, he indicated, makes possible the isolation of *Brucella* strains from infected humans and animals. As a result of its presence, agar cultures of tryptose and peptone M were converted from unsatisfactory to highly satisfactory media.

Huddleson experimented with killed and living cells of *Brucella bronchiseptica*, *Salmonella pullorum*, and *Salmonella typhosa* (Vi type) in addition to *B. abortus*, *B. suis* and *M. aureus*. He extracted



dense cell suspensions of the latter two micro-organisms by sonic disintegration in a magnetostriiction type of apparatus kept cooled to 15° C. by flowing tap water. He then separated the extracts into purified and crude fractions by (NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub> fractional precipitation and tested the

fractions for growth possibilities on the various media. Except for pH adjustment, the media were prepared according to the manufacturers' formulas. Preliminary studies of the purified fraction indicated the chemical nature of the growth factor.

for 14 years or more for foremen, craftsmen, operatives, and laborers occurred significantly more frequently in the lung cancer group than in the control group, they explained.

Individuals employed in the significant occupations comprised 45.3 percent of the lung cancer cases and 27.8 percent of the control group, they reported. It appears that the excess risk attributable to occupation among persons in various smoking categories ranges from 1.5 to 4.3 times the risk in nonsignificant occupations, they said.

It would also appear from these tabulations that occupation exerts the least effect on heavy cigarette smokers and that heavy cigarette smoking exerts its greatest effect on occupations not associated with lung cancer, they commented.

## Cancer Research and Control . . .

*Occupation does not seem to be directly related to lung cancer incidence among smokers. Cobalt<sup>60</sup> beam therapy is discussed, and the value of cancer public education programs is assessed. The contribution of epidemiology to etiology is the subject of still another report in this series of papers.*

### New York Studies Cancer Factors in Occupation

The possibility that the factor of occupation does not account for the higher incidence of lung cancer among smokers was indicated in a study of the occupational histories of cancer patients at Roswell Park Memorial Institute.

The study also indicated that the excess of lung cancer attributable to several specific occupational groups cannot be explained by smoking.

The study was sponsored by the New York State Occupational Cancer Committee. The report was presented by Morton L. Levin, M.D., Arthur S. Krans, M.S., Irving D. Goldberg, M.P.H., and Paul R. Gerhardt, M.D., who serve, respectively, as assistant commissioner for medical services, acting associate biostatistician, senior biostatistician, and director of the bureau of cancer control of the New York State Department of Health.

#### Study Conditions

One-hundred thirty-seven male lung cancer patients, and a control

group of 396 cases with nonrespiratory cancer, which had an age-residence distribution equal to that of the lung cancer group, were studied, they explained.

The study, they said, was made primarily to find clues for further study of occupations with an apparent excess risk of cancer of various types. The patient's occupation history included all previous employment.

A team of industrial chemists compiled a list of probable exposures to various chemical and physical agents, including suspected carcinogenic agents. Thus, specific information from the patient and the judgment of industrial chemists were used in determining possible exposure to various physical and chemical hazards.

#### Results, Discussion

Out of 18 major occupation groups, two, the metal trades and the construction industry, occurred significantly more frequently at the 0.05 percent level in the lung cancer group than in the control group, they reported. Exposure to free silica and to iron dust and excessive heat

### Cobalt<sup>60</sup> Beam Therapy Aids Cancer Patients

Patients suffering from some types of inoperable lung, rectal, and bladder cancer can expect a better chance of cure from extensive research with cobalt<sup>60</sup> beam therapy, said Ivan H. Smith, M.D., director of the Ontario Cancer Foundation, London Clinic, Victoria Hospital, London, Ontario.

This new form of irradiation, he continued, also promises longer life and reduced suffering for patients with incurable rectal, gastric, and pancreatic cancer. Another use of cobalt<sup>60</sup>, he predicted, will be in connection with surgery, particularly as a postoperative technique.

Smith made an interim report on 1,149 cases treated since the clinic began its clinical investigation on October 27, 1951. No conclusive results can be given for the new method of treatment, he said, since cancer cures aren't regarded as certain until the patient has lived for 5 years after therapy.

He referred to the response of lung cancer patients to cobalt<sup>60</sup> as "most



gratifying and often dramatic." The treatment was beneficial, in some degree, to 50 patients, 72.5 percent of the 69 cases treated, 70 percent of whom were in an advanced stage of the disease. Three of them are living 24 months after treatment and 27 have survived for 4 to 16 months, he reported.

### *Rectal Cancer*

It is Smith's opinion that in some cases of rectal cancer, cobalt<sup>60</sup> offers a palliative alternative to surgery for a limited group of elderly patients or "the odd cantankerous rogue" who refuses to have an operation. Improvement was seen in 25 patients or 75 percent of the 33 cases available for study. In most of them the disease was either advanced or had recurred after other forms of treatment. This is one of the forms of cancer for which Smith recommended the use of postoperative cobalt.

Smith said that cobalt has brought relief from pain and restoration of appetite to 10 out of 20 frail or elderly individuals with inoperable stomach cancer. Six of them are living 5 to 16 months after treatment. As a rule, the improvement is temporary, he said, and is followed by a later return of symptoms. He believes, however, that X-ray rotation therapy and a combination of chemotherapeutic agents should hold additional promise.

Cancer of the larynx is another type of malignancy for which Smith recommended cobalt<sup>60</sup> as the initial form of therapy with reliance on surgery if the disease recurs. He has also, he said, obtained worthwhile results with cobalt<sup>60</sup> in cases of oral cancer, relying on surgery in the event of complications or recurrences.

### *Cobalt Advantages*

The advantages of cobalt irradiation over conventional X-ray treatment, according to Smith, rest in the fact that a greater dosage of rays can be directed to tissues and organs in the interior of the body with less

danger to surface and other intervening tissue. He also believes cobalt enables patients to tolerate a greater dose of irradiation to a particular organ and the body in general in a shorter time.

There is still, however, a narrow breach between the amount of irradiation from any source which can be tolerated by normal tissue and the dosage necessary to cause lethal tumor damage, said Smith. The radiotherapist's major clinical problem today, in his opinion, is to find chemotherapeutic agents which will widen that breach.

Any form of irradiation, he said, is futile against widespread cancer, except for the temporary relief of symptoms, and then conventional X-ray therapy will bring the desired results. Leukemia and Hodgkin's disease are outside the cobalt realm, he stated.

## **Cancer Morbidity Studies Test Etiological Theories**

Although the incidence rate for all forms of cancer is almost identical for each sex, men run a 60 percent greater risk than women of developing common forms of cancer, except malignancies of the breast and genital organs, reported Harold F. Dorn, Ph.D., chief of the Office of Biometry at the National Institutes of Health.

However, until age 50 is reached, the incidence of cancer of the reproductive system among females exceeds the incidence of all forms of cancer among men, he said, using data from morbidity surveys conducted by the National Cancer Institute in selected urban areas of the United States in 1947 and 1948. The rates were adjusted for age to the total population of the country in April 1950.

Nearly one-half of all cancers among women originate in the breast or genital organs, he continued. In contrast, only 1 in 8, or 12 out of every 100 males who develop a malignant neoplasm, will have cancer of the genital organs or breast.

All other common forms of cancer occur more frequently among males than females, he stated. Excluding malignancies of the reproductive system, the incidence rate per 100,000 population becomes 290 for men and 181 for women.

### *Use for Etiology*

Dorn presented these statistics as an example of the use of morbidity data in the study of disease causation. Epidemiology is one of the tools used in etiology, he explained. The first step in the epidemiological process is an accurate description of the way a disease manifests itself in different population groups and subgroups and environmental situations.

The principal objective, he said, is to collect morbidity data for the purpose of formulating a hypothesis about causation, since the facts take on meaning only after they are organized and related to some theory. For instance, the fact that males are more likely to develop any form of cancer, except malignancy of the reproductive organs, suggests that they are more susceptible to cancer than females or that as a group they are more exposed to environmental carcinogenic agents.

Morbidity data, he continued, support the belief held by clinicians in the dependence of breast cancer development on the functioning of the endocrine system. Physiological changes associated with menopause, possibly hormonal in origin, temporarily slow up the rapid rate of increase in the incidence of breast cancer that is found prior to this age period. The strength of the association varies among different population groups and appears to be more marked among single women, according to Dorn.

### *Cervical Cancer*

For many years, Dorn said, clinicians have reported that cancer of the uterus was much less common among Jewish than among non-Jewish women and that cancer of the cervix uteri was exceedingly

rare, almost nonexistent, some thought. Preliminary results of comparative morbidity studies in Israel and New York City showed that the incidence of uterine cancer among Jewish women in Israel is less than one-half that among white women in the United States, Dorn reported. The incidence of corpus cancer is approximately the same for both groups, but cervical cancer was found about one-sixth as frequently among the Jewish women as among white women in this country.

The last finding indicates, he said, that cervical cancer, although infrequent, is far from rare among Jewish women. The difference between Jewish and non-Jewish incidence of all varieties of female genital cancer is real but not as great as formerly thought. Moreover, important variations in the incidence of genital cancer, he went on to say, were found within the Jewish population itself, which suggests that existing etiological theories may need to be examined and tested.

Dorn gave these examples to illustrate the epidemiological contribution to etiology. This, with knowledge gained from clinical experience and animal experimentation, can be components of hypotheses of causation, which must be tested by new clinical and epidemiological studies.

## Recognition of Symptoms May Delay Diagnosis

Do cancer education programs which spread a knowledge of symptoms cause the very thing they are trying to avoid—a failure to have the disease diagnosed in its earliest and usually most curable stage?

Consideration of this question is suggested to the Nation's health departments by Rose K. Goldsen, Ph.D., research associate in the Cornell University department of sociology and anthropology.

Goldsen believes that an ability to recognize the signs of cancer increases the anxiety of chronic worriers about the disease and makes

them delay any possible confirmation of their fears. Cancer knowledge has its desired effect only on persons who, aside from concern over a definite symptom, aren't particularly anxious about malignancy, she said. The appearance of a danger signal sends them to a physician immediately.

However, in Goldsen's opinion, familiarity with cancer symptoms isn't the deciding factor in early or late diagnosis. Good general medical habits seem much more important, she stated. People at all levels of cancer knowledge are much less likely to neglect possible signs of malignancy if they habitually consult a physician as soon as they become aware of the symptom of any disease.

Goldsen based these conclusions on a study conducted in 1951 and 1952 by Cornell University's social science research center under the sponsorship of the division of medical services of the New York State Department of Health. Interviews were held with 727 persons who visited tumor clinics and cancer detection centers for the diagnosis of conditions which might be cancer symptoms. Individuals who had postponed an investigation of their symptoms for 3 months or more were classified as delayers and were contrasted with people who had gone for an immediate checkup.

## Major Finding

The major finding was that delay in seeking diagnosis for an observed danger signal of cancer is a special case of chronic patient delay, Goldsen reported. Reaction isn't governed primarily by the implications of this particular symptom, but by the sociomedical habits, attitudes, and practices of a lifetime. Goldsen said that over half the patients who admitted that they had put off a needed medical examination in the past also postponed their visits to the tumor clinic. Only 15 percent of those who did not admit earlier procrastination were delayers in seeking cancer diagnosis.

Another finding, confirmed by other investigators, was that an inconspicuous cancer symptom brings persons in for diagnosis more quickly than an obvious one. This finding is one aspect of the relationship between reaction to cancer signs and good general medical habits, said Goldsen. The likelihood of extreme diagnostic delay is more than tripled if individuals who customarily postpone any medical examination or treatment notice a very obvious symptom, she continued. The chances that such a person will be a delayer are 52 in 100. On the other hand, the study found that when a person with good medical habits becomes aware of a hidden sign, the chances of delay are only 15 in 100.

## Additional Findings

Other factors in delay include self-diagnosis and a suspicion of cancer in the past. Also, persons who feared their condition might be "something serious" were less likely to delay diagnosis than those who diagnosed the symptom differently. Goldsen also reported that if a person had feared cancer in the past and found his suspicion unjustified, he was less likely to seek professional examination for a new symptom or a recurring one. This didn't apply, however, to persons who usually see a physician for any symptom.

Goldsen didn't find that cost considerations have much influence on delay. She did, however, find a link between delay in seeking professional advice and reluctance to discuss the cancer sign with everyday associates. Diagnosis was deferred by 45 percent of these reticent persons, she said, whereas only 29 percent of the less reserved were delayers.

Other factors influencing deferral are residence in rural areas and low educational and economic status, Goldsen reported. Indifference to one's unemployment also produces delay.

But the patient's general medical habits will either minimize or intensify all other factors. In Goldsen's

opinion, the problem of cancer delay should be approached by public health educators, not by stressing the knowledge of cancer signals, but by emphasizing the need for prompt medical response to the symptom of any disease.

## Public Cancer Awareness Brought Wider Attack

The American Cancer Society's public education program—the reason for which the organization was formed in 1913—succeeded so well that cancer consciousness among laymen increased more rapidly after that date than the ability of physicians to recognize tumors smaller than they had been seeing, said Charles S. Cameron, M.D., the society's vice president and medical and scientific director.

As people learned more about malignancy, he continued, the dangerous period of delay before diagnosis was reduced; diagnosis became more difficult for physicians, and the need for a program of professional education became apparent.

Greater public awareness of cancer, he said, also meant increased demands on clinical services, called for an expansion in medical social services, and showed a need for nursing care of patients in their homes.

### Broadened Program

Services of this kind could not be offered directly by the society, Cameron said, but existing professional agencies, such as clinics and nursing services, could be encouraged by financial aid, and new professional activities could be inaugurated by subsidies from society funds. Its present program of professional education, for instance, includes—in addition to publications and cancer seminars—fellowship grants for formal postgraduate training in cancer diagnosis and treatment.

The development of cancer clinics, where complex problems of cancer

diagnosis and case management are supervised by relatively small staffs, is another example of ACS efforts to meet increased demands for cancer services, according to Cameron. The society, he said, recommended the establishment of these clinics in 1929. The American College of Surgeons was invited to provide standards for the clinics' operation and certify those which qualified. There are now over 600 cancer clinics in the country, Cameron reported, and about two-thirds of them have been or are now being assisted by society funds.

### Patient Services

The service program is conducted at the local level by the society's divisions and units, within the limits

of broad national policies adapted to local needs, the speaker continued. Over 2,000 information centers are available to help the cancer patient and his family. Drugs, medication, and dressings may be provided, he said, and more than 250 articles of sickroom equipment, such as hospital beds or wheelchairs, may be loaned to needy patients.

### Research Grants

In 1944, the society was reorganized and its base of activity broadened to include the support of basic and clinical cancer research, Cameron reported. In 1953, it supported 283 specific projects in 111 institutions and 41 mass, or institutionwide, grants to 41 laboratories and universities.

## Childhood Accident Prevention . . .

*Epidemiological studies of accidents among children to learn more about how, where, when accidents occur are urged as a basis for effective prevention programs. The results of one such study are reported. Other approaches to childhood accident prevention discussed include Chicago's poisoning control program and New Jersey's experiment in mass safety education.*

## Proposes Dynamic Program Against Child Accidents

An epidemiological approach to the prevention of children's accidents, accompanied by a dynamic and continuous safety program, was urged by Ross A. McFarland, Ph.D., associate professor of industrial hygiene, Harvard School of Public Health.

Pointing out that 15 percent of all accidental deaths occur among children under 15, McFarland urged parents, educators, physicians and others to cooperate in education and training efforts and to help modify emo-

tional responses in children that may contribute to accident proneness.

McFarland held that accidental injuries and deaths follow some of the same biological laws as do disease processes and are amenable to controlled experimental studies, epidemiological surveys, and statistical analysis. Chief advantage of the epidemiological approach, he stated, stems from complex investigation of multiple causation.

Accident reduction may be accomplished through attention to the analysis of interaction of forces having to do with the host, the agent, and the environment. Prevention programs should begin with attempting

# CHILD ACCIDENTS

to control or modify those characteristics of the child which have been found to be important in causing accidents, he indicated.

## Accident Data

Such a program, McFarland stated, should begin with data on children's accidents: Who had them? When? Where? How did they occur? What were the circumstances? What characteristics of the child contributed to the accident? What behavioral indexes identify the child as one who may be unusually susceptible to accidents? What is the influence of other variables such as emotional upsets, feelings of rejection and non-acceptance, desire for parental attention, fatigue? What is the role of diet and blood sugar levels?

McFarland pointed out that reducing children's accidents through attention to the agent can be accomplished by isolating the host from the agent and reducing the virulence of the agent. Analysis will show that certain types of agents are involved in children's accidents more frequently than others, he said. These shift in emphasis with advance in age. He cited kerosene, lead poisoning, strangulation, and flammable clothing as examples.

Training in the recognition and avoidance of hazardous situations becomes especially important as the children become older, he said, pointing out that safety education should aim at safe practices without unduly restricting the natural proclivities of the child. Another approach toward reducing hazards calls for engineering and designing of equipment used by children, keeping in mind the age group for which equipment is intended. McFarland mentioned the design of harnesses and sleeping gear for infants as a case in point.

## Control Bases

Further analysis of accidents within the places they occur, by agent, type of accident and type of activity at the time of the accident,

yields specific clues as to the role of environmental factors and affords control bases.

Referring to the icebox deaths in the United States, McFarland pointed out that there are no reliable data on the frequency of these accidents. He stated, however, that these accidents afford a clear example of accidents which can be prevented through environmental control, either through the design of equipment for safety—doors which can be opened from the inside—or through modification of existing hazards by removing doors from discarded boxes.

The control of social forces which influence the incidence of accidents appears to lie in the provinces of educational and emotional hygiene, whether applied to parent-child relationships or to the social climate of play or school groups, McFarland concluded.

## Epidemiological Patterns Revealed in N. Y. Study

At least 92 percent of 120 fatal accidents in 1953-54 among children under 6 years of age could have been prevented, according to an epidemi-

ological study made by the New York City Department of Health.

Reporting on the study were: Harold Jacobziner, M.D., assistant commissioner, maternal and child health services; Patricia I. Heely, director, bureau of public health nursing; and Herbert Rich, senior statistician, bureau of records and statistics.

Pointing out that effective accident prevention programs must be based on facts concerning accident causation, they emphasized the need for employing epidemiological techniques in this field. Accidents follow a distinct epidemiological pattern, they declared, maintaining that the epidemiological approach should be as effective in controlling accidents as it has been in combating many infectious diseases.

In the New York study, Jacobziner and his associates specified, home visits were made by public health nurses to find out how, where, when, and to whom accidents occurs. They reported the following "unmistakable facts" from the study:

1. The highest incidence of fatal accidents was in children under 1 year of age, and the most frequent cause was so-called mechanical suffocation (see table).

2. Falls caused the second largest number of accidental deaths. They

**New York City Department of Health accident fatality study: cause of accident by sex, race, and age**

Cause of accident	Total	White			Nonwhite			Age in years					
		Total	Male	Female	Total	Male	Female	Under 1	1	2	3	4	5
Traffic.....	27	22	19	3	5	5	0	1	1	4	10	4	7
Poisoning.....	3	1	0	1	2	1	1	0	2	0	1	0	0
Fall.....	28	20	10	10	8	5	3	6	5	7	3	4	3
Burns.....	17	9	4	5	8	5	3	5	2	2	4	3	1
Suffocation.....	36	27	12	15	9	6	3	29	5	1	0	1	0
Submersion.....	6	6	5	1	0	0	0	1	2	1	1	0	1
Other.....	3	3	1	2	0	0	0	1	1	0	0	1	0
Total.....	120	88	51	37	32	22	10	43	18	15	19	13	12

were most frequent in the early ages, from less than 1 year to 3 years, and during the summer months.

3. Traffic accidents were most frequent at the active ages.

4. Completely without adult supervision when the accident occurred were 62.5 percent of the children.

5. A definite correlation was found between incidence of accidents and socioeconomic level of the family, the incidence being higher in the underprivileged areas.

6. Accidents were more common among boys than among girls and among nonwhite children than among white. (Twenty-six percent of the accidents occurred in the nonwhite population, but the nonwhite population is only 16 percent of the total population.)

7. Only five children had a definite history of previous accidents, indicating that "repeatism" is probably not established as a pattern at ages under 6 years.

The study also investigated handicapping conditions of the child and emotional and mental disorders of the parents as possible predisposing factors, but the evidence was inconclusive, they reported.

### *Public Health Nurse's Role*

In the opinion of Jacobziner and his associates, the public health nurse is the most logical choice to make home visits for a study of this type. Their reasons were these: She has intimate knowledge of the area involved and its people; she has had training and experience in establishing easy liaison and rapport with families; she can use the home visit for general public health instruction and guidance, as well as accident investigation.

## **Poison Control Program Launched in Chicago**

A poisoning control program, designed particularly to aid children who accidentally swallow household substances that may be poisonous,

has been in successful operation in Chicago for over 10 months, according to Edward Press, M.D., M.P.H., and Robert B. Mellins, M.D.

Dr. Press is chairman of the Chicago Poisoning Control Committee and is also associate director of the division of services for crippled children, University of Illinois. Dr. Mellins is an epidemiologist at the Communicable Disease Center, Public Health Service, on loan to the Chicago Board of Health.

The Chicago program is the first of its kind in the country, Press and Mellins reported. Centers in Boston, Cincinnati, Dallas, New York City, Phoenix, and Washington, D. C., have begun operating or are ready to start, they said. The Chicago group will act as a central agency for the collection and interchange of information.

### *Program Activity*

The Chicago program coordinates the efforts and resources of 20 hospitals, 5 medical schools, 4 full-time health departments, and others in a centrally guided plan for the treatment and prevention of accidental poisoning.

Press and Mellins stressed the importance of a looseleaf reference guide to the toxic constituents of thousands of household substances. The guide also outlines recommended treatments for patients who accidentally swallow any of these substances. It is made available to individuals and institutions affiliated with the program. Physicians in the emergency rooms of hospitals are free to modify the suggested treatments in accordance with their own best judgment.

The data on all cases treated, including the material swallowed, the major signs and symptoms, the treatment, and the results, are sent to the Chicago Board of Health on a form specifically developed for the program. These reports are analyzed and then summarized, Press and Mellins said, and the information is reported periodically to participating centers.

Members of the health department

make home visits or telephone calls, or both, to the families of children treated under this program. The visits are made primarily to help correct the conditions that led to the accidental swallowing of poison, but they also help to complete information on the type and amount of poison swallowed and on results of treatment. These contacts, they said, afford an opportunity to recommend general public health measures to the family and to leave home-safety checklists.

### *Program Results*

In the 10 months of the program's operation, 375 patients have been treated for swallowing a variety of substances—rat poison, kerosene, turpentine, insecticides, bleach, and lye, they reported. Only one death occurred.

Press and Mellins believe home visits to be effective in alerting the public to the danger of home accidents. Although admittedly a subjective evaluation, they felt that 131 of 147 home visits resulted in corrective measures that may prevent future accidents.

## **Fear Used to Educate May Arouse Anxieties**

When ought fear to be used to induce a population to adopt healthy practices?

Paul V. Lemkau, M.D., Johns Hopkins University School of Hygiene and Public Health, in his discussion of safety education without fear, stated that only when medicine has something to offer in the way of prevention should fear be used to motivate.

"When there is no technique available, when knowledge on which to base action does not exist, fear seems a weapon that has its dangers for the mental health of the people," he said, pointing out that fear was all right to use in typhoid fever campaigns since the disease can be stamped out. But he doubted the value of its use in

campaigns in which research is the only escape that can be offered to the anxieties of the populace.

Lemkau differentiated between anxiety and fear. Healthy fear, he said, of a dangerous situation about which something may be done may reduce its dangers. He declared that accidents are predictable events and to label them as accidents is a semantic error.

"Were accidents really accidents, we could have no preventive program," he said. "It is because they are events that are to some extent predictable, that we can analyze the various factors entering into the determination of their predictability and do something about them. Such analysis produces understanding and has the effect of reducing anxiety and healthy fear since the dangerous situation can then be better controlled," he said.

Accident prevention as a public health endeavor is fortunate in that the mechanics of accidents can be known, he continued. The cause and effect relationships are easily grasped, the factors of predictability offer the opportunity to reduce both fear and anxiety through their modification, and the fact that most people want to reduce accidents, at least consciously, makes the atmosphere favorable to accident prevention.

Zindwer described the project, in which approximately 40,000 persons participated and all local health units cooperated. She reported:

Preceded by an intensive campaign in which 1,191 local PTA units were alerted, a multiple-choice questionnaire was distributed to a 10-percent sample of parent-teacher membership throughout the State. Approximately 83 percent (25,000) of the questionnaires were returned.

The questionnaire was developed with the assistance of the APIIA professional examination service. Its 16 questions theoretically involve the respondents in situations common to the home and which are potentially hazardous to a small child. Pretesting demonstrated that the questionnaire was a powerful health education tool because people reacted emotionally to the extent that they were eager to debate the issues presented (see sample question).

Distribution of the questionnaire was augmented by local radio and newspaper publicity. A Rutgers University radio forum on child safety was rebroadcast over 17 radio stations. Eighty-three articles and nine editorials appeared in 55 newspapers.

Followup of the questionnaire so far has consisted in its discussion

at PTA meetings, publication of the preferred answers with reasons for their choice in the monthly publication of the State Parent-Teacher Congress, and similar publication of one question a week in the form of a child safety quiz in 28 newspapers. Similar radio coverage is planned.

Incomplete returns from an evaluation questionnaire sent to the various PTA chairmen indicates that local and county safety programs are scheduled. Other groups desire the safety questions for discussion. Requests are being received for the tabulation of answers, still to be completed, as well as for additional educational materials. A more detailed evaluation will obtain information on how local PTA chapters received the project and what specific plans are being made for further educational activities.

The New Jersey State Department of Health, Medical Society, Parent-Teacher Congress, Safety Council, the American Academy of Pediatrics (State chapter), and the National Safety Council are sponsors. The health department's actual cash outlay was \$300. Other costs have been borne by the sponsors, but the major cost was defrayed by the volunteer man-hours donated. The National Safety Council is doing the statistical processing.

## **An Experiment in Safety— The New Jersey Project**

Because home accidents among young children warrant special attention, New Jersey undertook an experiment in mass safety education during the spring of 1954.

By investigating the judgment and attitudes of adults in relation to these accidents, a new approach was made toward translating already existing knowledge into preventive action, according to Renee Zindwer, M.D., M.P.H., chief, bureau of maternal and child health, New Jersey State Department of Health.

### **Sample Question**

The Howards realize that children must not only be protected but should also begin to learn about possible dangers as soon as they can understand. They believe that they can best begin teaching their Johnny (18 months) the meaning of the word "hot" by:

1. Saying "hot" while allowing him to touch something just warm enough to startle him so that he will understand the word "hot" when used as a warning.
2. Saying "no, no, hot!" to him and pulling him away each time he approaches any hot object such as a heater, a stove, or a heated iron.
3. Repeating the word "hot" and spanking him whenever he gets dangerously near a hot object which may injure him.
4. Demonstrating the meaning themselves by pretending to touch a hot object quickly and then exclaiming "ouch, ouch, -hot!"

# Birth Certificate Data . . .

*Of interest to consumers of information obtained from birth records are the experiment in improving the quality of vital statistics which is now under way in several States, and the problem of inaccurate reporting which one health department found when it surveyed current obstetric practice in the community.*

## Vital Statistics Methods Important to Consumers

Changes in the methods of producing national vital statistics are important from the consumers' viewpoint as well as the producers', declared Howard West, M.P.H., chief of the biostatistics and health education division, District of Columbia Department of Public Health.

Under new procedures, several States are coding birth certificates and furnishing punched cards for tabulation by the Federal Government. West called this experiment "the most far-reaching and fundamental step" thus far to speed production and to cut costs, but he indicated that it may create problems for consumers of the data.

The selection of items that should be included on the punched cards previously was the responsibility of the National Office of Vital Statistics. This function will be increasingly shared with the States, West noted. Whether in the long run such joint consideration will benefit consumers cannot be answered now, he commented. Other questions relate to whether comparability will be maintained in interpretation, in classification, and in the carrying out of the numerous other statistical processes.

West asserted that a quality control procedure for the State-prepared cards would appear to be basic. He warned that selection of a State's birth records for one month as a sample for quality control would not be adequate to discover significant errors or provide means for their cor-

rection. For this reason and to facilitate special studies by the NOVS, he indicated that copies of all the records should be made available.

### State Preparation of Tabulations

West also urged consideration of the gains and losses to the data that can be anticipated if States prepare birth tabulations for use in producing national statistics.

He suggested two possible gains: earlier publication of national statistics, if all States tabulate simultaneously and maintain the schedule; and improvement in the quality of State staffs and in the caliber of State vital statistics activities. On the debit side he noted these problems: quality control, rigidity of tabulations, and lack of data to satisfy unanticipated needs for national statistics.

## Study Shows Inaccuracy Of D. C. Birth Certificates

Problems of under-reporting and over-reporting on birth certificates handicap the District of Columbia's obtaining a true picture of its current obstetric practice.

This was the reaction of Ella Oppenheimer, M.D., director of the bureau of maternal and child health, District of Columbia Department of Public Health, after a 1952 survey of birth certificates and matching hospital records revealed these chief deficiencies. The hospital records were assumed to be correct.

As part of a more detailed study to improve standards of maternity care, the investigation of matching records was devised to test the adequacy or accuracy of 24 items on the official birth certificates.

The selected items, some of which appeared on a detachable medical information supplement to the certificate, included: length of gestation, birth weight, type of delivery, need for artificial respiration of the infant, complications of pregnancy and labor, duration of labor, and the occurrence of congenital malformations and birth injury.

Birth weight, Oppenheimer said, was the only item reported with 98 percent completeness and accuracy. Length of gestation was found grossly inaccurate, with an extraordinary concentration of births in the 40-week category—76 percent as compared with 19 percent on comparable hospital records.

In one hospital with a study sample of 148 births, none was specified on the birth certificate as requiring artificial respiration, whereas the medical records showed 29 required it, she reported.

Oppenheimer said the health department can correct incompleteness of response by a conscientious inquiry into the reasons for such deficiencies. Since the reporting of this information is required by law, failure to comply cannot be well defended by the hospital or physician, she declared.

A program of enforcement could help, she said. Better cooperation, she added, can be expected from physicians if the reporting is simplified, if it is known that the data reported are being used, and if the value of these data is demonstrated through the dissemination of periodic reports of the findings.

Inaccuracy of response is a more difficult problem, demanding careful revision of the wording of items, as well as orientation in the meaning of the terms employed, she continued. The medical information requested on the birth certificate should be such that it can be reasonably obtained by the hospital staff



and appears to have relevance to the current problems of maternal hygiene.

The medical supplement to the birth certificate must not be permitted to become a fixed part of this vital record in terms of its contents,

Oppenheimer concluded. As information is obtained, and a given problem clarified, it may be appropriate to delete the item. Furthermore, newly developing problems, or ones demanding a fresh inquiry, may call for the addition of new items.

ness, established occupational deafness, and the elderly who exhibit a higher degree of hearing loss than the younger workers. Industry can benefit from their skills and still safeguard its risk by giving periodic hearing rechecks, he explained.

The regulation of hours of exposure to excessive noise, with provision for periods of recovery of the inner ear, the elimination of confined spaces, the use of ear protectors, the elimination of vibration in machinery are all important features of a program designed to eliminate occupational deafness, he said.

## Workers' Compensation Plans . . .

*Indicating a need for cooperation by management, labor, and compensation boards, an otologist suggests steps to meet the problem of occupational hearing loss. Reports from the United States, Canada, and Great Britain discuss workmen's compensation programs—benefits, costs, and recommendations for improvements.*

### Suggests Program Against Industrial Hearing Loss

A constructive approach to the problem of occupational deafness, Abraham I. Goldner, M.D., a Flushing, N. Y., otologist, said, will avert the needless sacrifice of hearing ability provided that full cooperation is given by management, labor, and compensation boards.

Goldner, chief of Flushing Hospital's audiological clinic, reported that metal, pneumatic tools, spinning and weaving, aviation, telephone, rail transportation, repair shops, and similar industries are apt to have a noise hazard.

The bulk of occupational deafness exists at a subclinical level and is generally discovered, he observed, by virtue of an accident, superimposed pathology, routine audiogram, or a concerted group drive to obtain compensation.

#### Full Cooperation

Industry, he stated, must recognize that a health problem exists. It is his belief that industry must co-

operate with and financially support the enterprises now seeking further information about occupational deafness. Labor should avoid adamant attitudes and seek adoption of measures based on scientific accuracy rather than economic expediency.

Administrators of workmen's compensation laws and legislators, he noted, should be receptive to methods of cushioning severe financial blows. He believes they should also support research designed to lessen the acoustic hazard and facilitate the accurate evaluation of hearing loss and the proper determination of its cause.

All must recognize, he said, the existence in the population at large of a vast reservoir of undetected and unsuspected hearing impairments of various degree and cause. Only a careful hearing examination, including the audiometric evaluation, will demonstrate this loss, he said.

In Goldner's opinion, audiometric examinations should be part of the preemployment physical examination. The preemployment audiogram will make possible the hiring of workers with damaged ear drums and middle ear diseases, conductive deaf-

### Industrial Injuries Plan In Great Britain

In Great Britain, the worker's compensation for an industrial disablement is now based on the degree of loss of physical or mental faculty and not on loss of earnings.

Disablement assessment by medical rather than economic criteria and other features of Great Britain's insurance system covering industrial injuries, which replaced the national workmen's compensation procedures in 1948, were described by Arthur Massey, M.D., D.P.H., chief medical officer of the Ministry of Pensions and National Insurance, London, England.

#### Supplements Wages

Under the new plan, Massey reported, a beneficiary may get an industrial disability pension while earning as much as he can. It follows, he said, that the pensioner has no financial incentive to refrain from working at full capacity.

Three types of benefits—industrial injury, disablement, and death—are available to eligible claimants among the 20½ million employed persons covered by the Industrial Injuries Act, Massey reported. He described the system as follows:

An injury benefit is payable up to 26 weeks to a person incapacitated by an accident or an occupational



disease. A disablement benefit is payable if incapacity for work continues after the injury benefit stops.

The usual disability benefit rate ranges from 11 shillings a week for a 20-percent disablement to 55 shillings for a 100-percent disability. A lump sum payment is made to persons less than 20-percent disabled. Various supplements, such as an unemployability supplement and allowances for constant attendance, special hardship, and hospital treatment, may also be awarded.

First, the local insurance office, one of the approximate thousand located throughout the country, decides whether an accident has arisen out of and during the course of employment and, on the basis of a medical certificate, whether it has caused incapacity for work. Most disease cases are referred for diagnosis to a local examining medical practitioner.

After the local insurance officer has admitted the claim, general medical boards at more than 100 strategically located centers assess the degree of disablement or loss of faculty caused by the occupational accident or disease (with the exception of pneumoconiosis, byssinosis, and tuberculosis).

### *Special Assessment*

Tuberculosis, the first disease really common in the general population to be covered, is diagnosed by a chest specialist. Scheduled occupations consist mainly of medical treatment or nursing of tuberculosis patients, and ancillary hospital work, and research, laboratory work, or autopsies in connection with tuberculosis.

Pneumoconiosis and byssinosis are also considered separately, and the successful claimant proceeds direct to disablement benefit without antecedent injury benefit since the incapacity occurs in the late stages.

Special medical boards at nine main centers, accessible to such industries as mining, pottery, metal working, and cotton spinning, verify by clinical examination a preliminary pneumoconiosis or byssinosis

diagnosis and assess the amount of disability.

Pneumoconiosis is now compensated down to 1 percent of disablement. The limit before 1954 was 5 percent. In a recent development, a benefit may be allowed for pneumoconiosis contracted in an unscheduled dusty occupation.

Admission of byssinosis claims is predicated on two conditions: at least 20 years of employment in a scheduled occupation and permanent disablement amounting to 50 percent or more. Prior to 1948, a 100-percent disablement was required. Coverage, formerly applying only to raw cotton workers, has been extended to certain categories of waste cotton workers.

Diseases added to the schedule since 1948, in addition to tuberculosis, are beryllium poisoning; carcinoma of the mucous membrane of the nose or associated air sinuses and primary carcinoma of a bronchus or of a lung occurring in nickel workers; and papilloma of the bladder in certain chemical workers. There are now 39 occupational diseases on the schedule.

The industrial injuries fund is formed by weekly contributions from employers and insured persons. To this is added an exchequer payment at the annual rate of one-fifth of the sum of the combined contribution.

## **Rehabilitation Needs Link To Compensation Services**

The most promising aspect of State workmen's compensation programs is rehabilitation, declared Jerome Pollack, B.S., program consultant, social security department, CIO-United Automobile Workers. However, he said, rehabilitation services are not included as part of workmen's compensation in most States, and they are not well coordinated with services provided under the workmen's compensation program.

It has been estimated that in the United States only 3 percent of the

workers injured on the job are receiving the types of services they need to rehabilitate them, Pollack stated.

According to Pollack, the extent of medical care programs is far greater than was anticipated when the workmen's compensation laws were written. Four out of five civilian employees are now entitled to medical care for work-connected injuries, he said, and the cost of the workmen's compensation program is about 3 percent of all private expenditures for medical service and about 17 percent of the amount paid by voluntary insurance plans. Care for occupational injuries is not provided by these plans, Pollack said, and as they become more comprehensive, greater coordination with workmen's compensation will be needed.

Under present workmen's compensation programs, the extent and amount of medical care are limited by statute in many States, and rehabilitation frequently is not possible within these limits, Pollack stated.

Early legislation did not stipulate the quality of medical care to be provided injured workers and often limited fees to the amount charged "in the same community for similar treatment of injured persons of a like standard of living." This criterion is subject to a variety of interpretations and does not always result in the best care for the patient, Pollack said. He stated that in all but nine States the employer or the insurance company designates the physician.

### *Rehabilitation Services*

In most States, rehabilitation is not sufficiently coordinated with the Federal-State vocational rehabilitation programs, Pollack stated. Personnel and facilities are scarce, and patients must often travel long distances to reach the few rehabilitation facilities that are available. Also, he maintained, new incentives are needed to encourage interest in rehabilitation; most employees are not sure of its advantages and many

prefer a cash award or a permanent pension.

Pollack recommended that a study be made to determine how to assure workers of competent and impartial care. He suggested that minimum standards for handling medical care problems be established for insurance companies, State funds, and employers' medical departments, and that the function of the industrial board or commission in medical care be explored.

He also recommended that rehabilitation be made a benefit of workmen's compensation and available to all who need it.

## Workmen's Benefits High, Employer's Costs Low

Ontario's 40-year experience with a workmen's compensation program has proved so satisfactory to employers, workmen, and the medical profession that it has been copied by every other Canadian Province.

Authors of this statement and of a description of the Canadian Province's program in relation to quality of medical care were B. H. G. Curry, M.D., chief medical officer of the Ontario Workmen's Compensation Board; J. E. F. Hastings, M.D., D.P.H., research fellow, and G. H. Hatcher, M.D., D.P.H., assistant professor, both of the University of Toronto School of Hygiene; and Mary A. Ross, M.A., Ph.D., medical statistician of the Ontario Department of Health.

### *Program Features*

In addition to the exclusion of the law courts and private insurance companies from its administration, the plan features comprehensive medical care provided by private medical practitioners on a fee-for-service basis under the supervision of the three-member Ontario Workmen's Compensation Board, they reported. At present the board, appointed by the government, is composed of a former employer, a former

union representative, and a physician.

The board is the sole judicial and administrative authority for collecting premiums from employers, adjudicating and paying benefits to injured workmen and supervising complete medical care, including rehabilitation, they said.

The benefits were termed more generous and the costs to employers less, than in most American jurisdictions. This has been achieved without direct cost to the workmen or to the taxpayers, they said, since the complete costs are obtained by annual assessments from the employers.

In 1952, they reported, Ontario paid 75 percent of the employee's maximum earnings up to \$4,000 a year, or \$57.69 a week, for total disability from the first day of the accident, either as a lifetime pension or for the term of disability.

Since no money is spent on litigation or insurance company administrative costs and dividends, they pointed out, 89 cents of every \$1 paid for workmen's compensation is spent on payments or medical benefits to workmen.

### *Medical Care*

Throughout the administration, they said, the pressure is on the injured workman and his employer to seek the medical care needed for an industrial illness or accident. It is the general policy to let the patient choose his own physician and to get remedial surgery in a general hospital.

The physician, the employer, and the employee each submits a notification of accident to the board. The physician also submits his accounts and details of care to the board and is paid on a fee-for-service schedule approximating the minimum recommended by the Provincial medical association.

The remuneration rate is high enough to keep the physician from being dissatisfied with care of compensation cases, they stated, and the

quality of his services is also governed by the knowledge that the diagnosis and treatment are reported to the board and may be reviewed by other competent physicians.

To augment this care, they reported, the board maintains wards in several hospitals where problem cases may be brought for assessment and a special 518-bed medical rehabilitation center, where physical medicine and work trials can be conducted.

Featured at the rehabilitation center, they reported, are conditions set up to simulate those of the workman's actual job, laying railroad track, for example. The patient must demonstrate that he is able to work a regular 6-hour day before he is discharged to full employment.

## Outlines New Guidelines For Compensation System

A set of operating guidelines for a "modern workmen's compensation system" which the Subcommittee on Industrial Relations of the American College of Surgeons feels essential for the attainment of the basic principles for the rehabilitation of the disabled worker was outlined by Alexander P. Aitken, M.D., chairman of the group.

On the subcommittee, Aitken said, were representatives from labor, insurance carriers, public health and vocational rehabilitation agencies, and the medical profession. He said they unanimously agreed on the report, the product of 4 years of study.

Some of the proposals outlined by Aitken can be put into effect only by changes in administrative rules and in the compensation laws.

The rehabilitation problem, Aitken said, is one of many facets. Although it is of direct concern to the medical profession, he said, the failure of labor, management, insurance carriers, administrators of compen-

birth order were also put aside, as were those showing plural births. This left 42,277 births remaining for study, Rider and his co-workers reported. Of this total, 27,979 were white and 14,298 were nonwhite.

Results of Study

They found that 6.8 percent of the white infants born singly and alive were premature. The frequency varied from 7.3 percent in the lowest socioeconomic tenth of the city to 5.1 in the highest. The differences between economic strata became even more apparent, they said, when the figures were adjusted for maternal age and birth order. The ratios then ran from 5.0 percent at the highest level to 7.6 at the lowest. Neither adjusted nor unadjusted figures, Rider and his associates reported, showed much variation among the lower four brackets.

Incidence of Prematurity Higher at High Altitude

Studies of the effect of altitude upon birth weight have been prompted by the discovery that the incidence of premature babies (as determined by birth weight) for a high-altitude county in Colorado is three times the

State average. Thus far the findings are not conclusive, according to the report by John A. Lichty, M.D., Rosalind Y. Ting, M.D., M.P.H., Paul D. Bruns, M.D., and Elizabeth Dyar, Ph.D.

Dr. Lichty, Dr. Ting, and Dr. Bruns are, respectively, associate professor of pediatrics, pediatric research fellow, and associate professor of gynecology and obstetrics, University of Colorado Medical School; Dr. Dyar is professor of nutrition and dean, School of Home Economics, Colorado A & M College.

Local physicians, they noted, have stated that many of the babies born in this county (Lake County) are small but are not prematurely born. Supporting this idea is the fact that neonatal mortality was only about twice the State average for the same period, 1949 through 1953, they indicated.

To test the theory that high altitude accounts for the high incidence of premature, or small, babies in Lake County (altitude, 10,000 to 11,000 feet), comparisons of birth weights of babies born there with birth weights of babies born elsewhere were made. Some of the data are shown in the table.

In each weight group, Lichty and his associates specified, the Lake County babies were about three-

fourths of a pound smaller than babies born in Denver (altitude, 5,280 feet). The fact that the percentage distribution of weights for babies born in Cripple Creek, Colo. (altitude, 9,000 feet), is closer to the distribution for the Denver babies than to the distribution for Lake County babies, however, seems not to support the theory, they noted. But they considered the reliability of the Cripple Creek distribution questionable because of the small number of babies involved.

Race and Diet

Also investigated was the possibility that race is a factor in the high incidence of prematurity in Lake County, since about one-third of the county's population is "Spanish." Comparison of average birth weights of "Anglo" and "Spanish" infants in this county and in Denver revealed no significant difference between the two race groups, they stated. They suggested, however, that the factor of race be studied further.

Diet likewise seems not to be related to the prematurity situation, they indicated. A comparison of dietary intake of Lake County mothers of full-term babies with that of Lake County mothers of premature babies did not reveal any significant difference.

Percentage distribution of birth weights

Birth weight in grams	United States <sup>1</sup> (percent)	Baltimore <sup>2</sup> (percent)	Denver <sup>3</sup> (percent)	Cripple Creek, Colo. <sup>4</sup> (percent)	Lake County, Colo. <sup>5</sup> (percent)
1,000 or less----	0.5	0.6	0.7	0.4	0.9
1,001-1,500-----	.6	.7	.8	1.6	3.3
1,501-2,000-----	1.4	1.8	1.9	5.3	13.7
2,001-2,500-----	4.9	5.8	8.3	10.6	30.4
2,501-3,000-----	18.1	23.3	27.4	31.4	32.2
3,001-3,500-----	37.7	39.4	40.8	39.6	17.2
3,501-4,000-----	27.1	21.8	16.7	9.0	2.4
4,001-4,500-----	7.7	5.5	3.0	2.0	-----
4,501 or over----	2.1	1.1	.3	-----	-----

<sup>1</sup> Number of babies, 33,000.  
<sup>2</sup> Number of babies, 9,523; altitude, sea level.  
<sup>3</sup> Number of babies, 10,566; altitude, 5,280 feet.  
<sup>4</sup> Number of babies, 244; altitude, 9,000 feet.  
<sup>5</sup> Number of babies, 577; altitude 10,000 to 11,000 feet.

Perinatal Mortality Rate Shows Areas of Need

The socioeconomic conditions of expectant mothers, their state of health, and the care they receive during pregnancy are, aside from obstetric services, the determining factors in death rates for infants during the first week of life and after 28 weeks of gestation, according to the implications of a study reported by three members of the New York City Department of Health. These periods of early life and late fetal existence are grouped under one classification—called perinatal—because similar conditions

may cause death at both stages, said Jean Pakter, M.D., chief, maternity and newborn division, Carl L. Erhardt, B.B.A., director, bureau of records and statistics, and Harold Jacobziner, M.D., assistant commissioner.

Recent years have seen marked progress in saving the lives of mothers and older infants, they reported, but the least improvement, shown by a comparatively slow decline in perinatal mortality rates, has been in bringing pregnancies to a successful conclusion. In New York City, where home deliveries are extremely rare, this is largely a hospital problem, they said.

The reported study analyzed New York City data for 1951 and 1952 to determine the perinatal death rates in individual hospitals and to discuss the factors, other than obstetric care, influencing the rates.

## *Hospital Population*

Pakter, Erhardt, and Jacobziner believed that the race, age, and parity of the patients and the extent of their prenatal care, among other factors of hospital population, are constant influencing factors. Race, they said, is largely influential since it reflects socioeconomic status. Mortality rates in the three categories of hospitals studied were quoted to support their contention.

A tabulation showed that more than 180,000 deliveries occur annually in 103 city hospitals. Approximately two-thirds of the mothers in this area are under private care, they said. The mothers are delivered either at proprietary hospitals—privately owned business enterprises open only to patients who pay the full cost of their care—or at voluntary hospitals which are nonprofit institutions with varying numbers of paying and nonpaying patients. One-third of the mothers, the study found, are delivered either at municipal hospitals, which largely provide free care, or in the public wards of voluntary hospitals.

Infant death rates, fetal death ratios, and perinatal mortality rates

were found to be highest for municipal, lowest for proprietary, and median for the voluntary hospitals, they reported. The inference is clear, they said, that higher mortality rates are associated with hospitals caring for people of the lower socioeconomic groups.

## *Size and Location*

Two other factors were investigated for their possible effect on infant and fetal mortality—the size and location of hospitals. But these components appear to influence the rates only insofar as they reflect the background of the patients, they reported. Large municipal hospitals which cared for a great number of nonwhite patients showed significantly higher death rates than other large hospitals in the same category whose patients were mostly white.

The study showed that the aggregate perinatal mortality rate was found to be highest in Manhattan borough and lowest in Queens. They related this finding to the fact that 45 percent of the women delivered in Manhattan are service or nonpaying cases whereas in Queens the proportion of service cases is only 20 percent.

A number of other investigators were quoted in support of the thesis that medical care is not the whole answer and indicated that a relationship exists between infant and fetal death rates and the dietary and other prenatal care received by mothers.

## *Hospital Care Index*

Investigation is needed, they said, to determine the extent to which hospital perinatal mortality rates represent indexes of obstetric care. Any such evaluation, they continued, must allow for the extrinsic factors considered in this study. But even without this adjustment, they believe that the rates are the most useful means of focusing the attention of public health administrators on areas in need of assistance. For instance, they concluded, the New York City Department of Health intends to

study closely those hospitals in which the perinatal rates exceed the city mean for their own institutional category.

## **Proposes Plan to Speed Prematures to Centers**

A simplified plan for speeding prematurely born infants from hospitals to regional premature centers was advanced by Edward H. Townsend, Jr., M.D., director of the Rochester Regional Premature Center of the Rochester, N.Y., General Hospital.

Townsend's proposal would cut at least half of the time it now takes to transport the premature infants to the center by shifting the burden of transport responsibility from the regional hospital service to the hospital of delivery.

The way Townsend sees it, the hospital of delivery would first call the premature service to see if the infant can be accommodated. Then, after approval, a nurse would take the baby in any available vehicle equipped with a Prager carrier or portable incubator that can operate from an automobile electrical system. Thus precious time, crucial in this stage, would be saved. Waiting for the ambulance to arrive from the premature center, as far as 100 miles away, would be avoided.

The mortality rate among premature infants is maximal during the first 24 hours of life (57 percent) and 87 percent of the deaths attributable to prematurity occur during the first week of life, Townsend asserted. Hence, prematures should be moved before intervening complications dominate the picture, he maintained. Small hospitals, unable to spare nurses for transportation services, would have to solve this problem under the new plan.

Another advantage of the plan is that the prematures could be transported regardless of the time of delivery instead of waiting as is done now for daytime ambulance services from the regional center.

The Rochester Regional Premature Center serves a 10-county area in upstate New York, Townsend said. It was built by private funds but is operated with the cooperation and assistance of the bureau of maternal and child health of the New York State Department of Health.

Premature centers, whether urban, suburban, or rural, have prime responsibilities to the region they serve, Townsend said. First is the actual care of the premature infant, but of equal importance are the study and research of the problems of prematurity and the continual demonstration of optimal premature care; a premature center should serve as a station from which and to which physicians and nurses may travel to observe, to teach, and to improve the care of the prematures in the region served.

## Find Perinatal Deaths Equal Deaths to Age 40

In New York State in 1951 perinatal mortality, deaths occurring after the fifth month of pregnancy and before the second month after birth, equaled the number of deaths in the age group between 1 month and 1 day and the 40th birthday, according to Edward R. Schlesinger, M.D., associate director, division of medical services, and Norman C. Allaway, biostatistician, New York State Department of Health.

Fetal and newborn deaths are the major remaining mortality problem in the field of maternal and child health, they said. The trend toward concentration and narrowing of the problem of perinatal loss demonstrates the need for increased research and public health services for women who present a history of previous child loss, they asserted.

Comparison of the 1951 study with the study made in 1936 shows that relatively little progress has been made in reducing the rate of perinatal loss in the more vulnerable group of women, those who suffered

previous child loss, they reported. No improvement can be demonstrated in the most vulnerable group of all, women with a history of loss of three or more previous children, they added.

Women who experienced perinatal loss were 2.7 times more likely to suffer loss in subsequent pregnancies than women without such loss, according to the 1951 study. In 1936 this figure was only 2.2, Schlesinger and his co-workers said. The expectation of loss in later pregnancies (see chart) increases sharply with the number of previous losses, they reported.

### Comparing the Studies

Comparison of the 1951 and 1936 studies showed the following:

The 1951 study included 106,344 births (fetal deaths and live births) as compared to 53,653 in 1936. In 1951, only 46 percent of the women had had only one previous child; in 1936, this figure was 38 percent. Only 7 percent of the 1951 group had had five or more children; in 1936, this figure was 18 percent. In 1951, 12 percent of the women had lost one previous child or more; in 1936, 24 percent had lost at least one child.

In 1951 mothers had a previous child loss rate of 68.0 per 1,000 total births; in 1936 the rate was 124.5. The fetal death rate was 16.6 per

1,000 total births as compared to the rate of 26.0 in 1936. Neonatal death rate in 1951 was 18.6 per 1,000 live births; in 1936 the rate was 30.4. The perinatal death rates in 1951 and 1936 were 34.9 and 55.6 per 1,000 total births.

In 1951, the perinatal death rates among children of mothers according to previous loss ranged from 29 among women with no previous loss to 253 among those with 4 or more previous losses. In 1936 the corresponding rates were 43 and 189.

## Tests Value of Services For Colorado Prematures

How many and what kind of illnesses do premature infants have during their first year?

What are the differences in the kind and amount of preventive illness services received by premature infants with less than 4 illnesses and those with "many" (4 or more)?

Could any of these differences be utilized in preventing illnesses in these children?

The answers to these questions were the objectives of a study reported by Georgia B. Perkins, M.D., M.P.H., assistant professor of preventive medicine and public health, University of Colorado School of Medicine, and regional medical director, Region VIII, Children's Bureau.

The study was based on a sample group of 144 premature infants admitted to the Premature Infant Center of Colorado General Hospital.

Perkins reported the following findings:

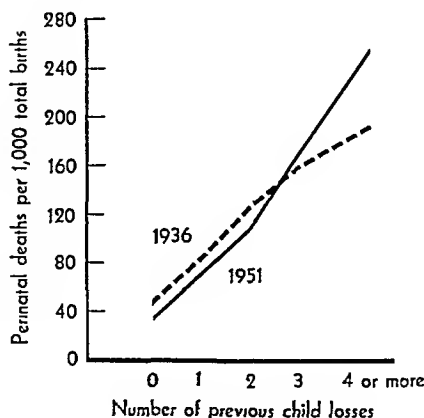
Of the group, 124 were alive at discharge.

The number of illnesses of the premature infants followed for 1 year (86) varied inversely with the length of medical supervision.

Seventy-three percent of the infants had few illnesses, and 27 percent had many illnesses.

Sixty percent of the illnesses were infectious in origin, and 70 percent

Perinatal death rates by number of previous child losses in the 1936 and 1951 studies in New York.



of these were of the respiratory-pulmonary system.

Fifty-two percent of the hospitalized and 65 percent of the nonhospitalized illnesses were potentially preventable.

The routine child health conference, the pediatric clinic, and the emergency room shared equally in the care of these illnesses.

Babies weighing 1,001 to 1,500 grams at birth had fewer illnesses than those weighing more or less. This suggests the possibility of re-evaluating discharge criteria.

Babies kept in the hospital for 41 days, or more, after birth were less likely to have many illnesses than those kept 40 days or less.

Analysis of the time of public health nurse visits suggests the possibility that these visits help prevent illness.

The highest percentage of those having many illnesses had no medical social service. Analysis of medical social service suggests a definite and direct relationship to illness prevention.

They found little beriberi or other disabilities which could clearly be ascribed to a lack of thiamine. Unusually severe retinitis which produced marked and more or less irreversible lowering of visual power was apparently not due to thiamine deficiency alone. Further investigation of the condition, which, they said, could be the result of combined deficiency in the type of diet described, was recommended.

### *Vicious Circle*

Rake and Yang believe that chronic undernutrition and vitamin deficiency predispose to chronic parasitism, all other things being equal. Certainly, they continued, parasitism predisposes to increased malnutrition. Hookworm infestation, for example, was as high as 34 percent among the Marines at Tsoying, where some of the nutritional studies were carried out. Anemia was prevalent in some units, they reported. In some cases it was macrocytic in character and probably due to the marked deficiency of B<sub>12</sub> and partial deficiency of folic acid. However, they said, hookworm infestation is undoubtedly also responsible. Most, if not all, the patients who had severe anemia harbored hookworms.

### *Recommendations*

Measures suggested by Rake and Yang for the improvement of general health conditions included an attempt to eliminate the intestinal worms by the use of a polyvalent vermifuge. Addition to the diet of deficient vitamins and other nutrients was also recommended.

## **Canada Reports Nationwide Height-Weight Survey**

For the first time in Canada, individual heights and weights can be compared with a true national average, according to L. Bradley Pett, M.D., Ph.D., chief of the nutrition division, Department of National Health and Welfare, Canada.

# Health in Foreign Countries . . .

*From Canada, Formosa, England, and Australia come reports concerning problems and programs in a variety of health and related fields: relationship of weight to health, nutrition, laboratory and radiological services, rehabilitation of derelict families, social-medical research, and zoonoses.*

## **Show Vitamins Lacking In Ample Rice Diet**

Chinese National Army troops stationed in Formosa received an abundance of calories from a predominantly rice diet, but were afflicted with vitamin deficiency disease that ranged from severe to mild, according to a study conducted in the spring of 1954.

Geoffrey W. Rake, M.B., and Wen-Tah Yang, M.D., respectively, research professor of microbiology in the department of medicine at the University of Pennsylvania and the deputy surgeon general of the Chinese National Army, said that parasitism was prevalent, but often in a relatively symptomless form.

The basic ration of cereal, soybeans, and oil was uniform for all troops, they said, but a system of local purchase caused the type and

even the amount of animal protein and vegetables to vary among different units. In general, the diets were markedly deficient in fat, B<sub>12</sub>, and calcium, and somewhat deficient in niacin and ascorbic acid. The principal vitamin deficiencies in the diet, they reported, were in riboflavin, vitamin A, and niacin.

### *Unexpected Finding*

Rake and Yang said that there was surprisingly little evidence of disability produced by ascorbic acid deficiency. They suggested that pyorrhea, very prevalent among the troops, might conceal lesser effects of this deficiency on the gums. The possibility that pyorrhea may itself be an indication of vitamin C (ascorbic acid) deficiency is more interesting, they continued, and said that this was observed in Denmark after World War II.

Tables, believed to be the first of their kind obtained by statistical sampling of the heights and weights of an entire population, have been compiled and will be available from the Department of National Health and Welfare.

"Weight relationships to health are among the most fundamental problems needing study at the present time," Pett said, and these data should provide a sounder basis than has been available heretofore for studying the effects of weight in aging and in the degenerative diseases.

Using the area stratification method, the Canadian study obtained height, weight, and age data for 22,000 Canadians in 1953. Remote areas as well as heavily populated regions are represented in the random sample.

Overweight is not the same thing as obesity or adiposity, Pett con-

tinued. Lack of clear definitions has resulted in actual misuse of these words, and when it becomes possible to differentiate these terms, greater understanding of the importance of diet and greater success in controlling degenerative diseases may result, he stated.

Muscular hypertrophy may result in increased weight, Pett said, whereas a moderate accumulation of fat may not do so, and therefore, in defining obesity or adiposity, it becomes important to have some measure of body fatness or leanness in addition to weight and height measurements. For this reason, in the Canadian weight-height survey, a skinfold measurement on the back of the upper arm was included in the data.

### *Height-Weight Increases*

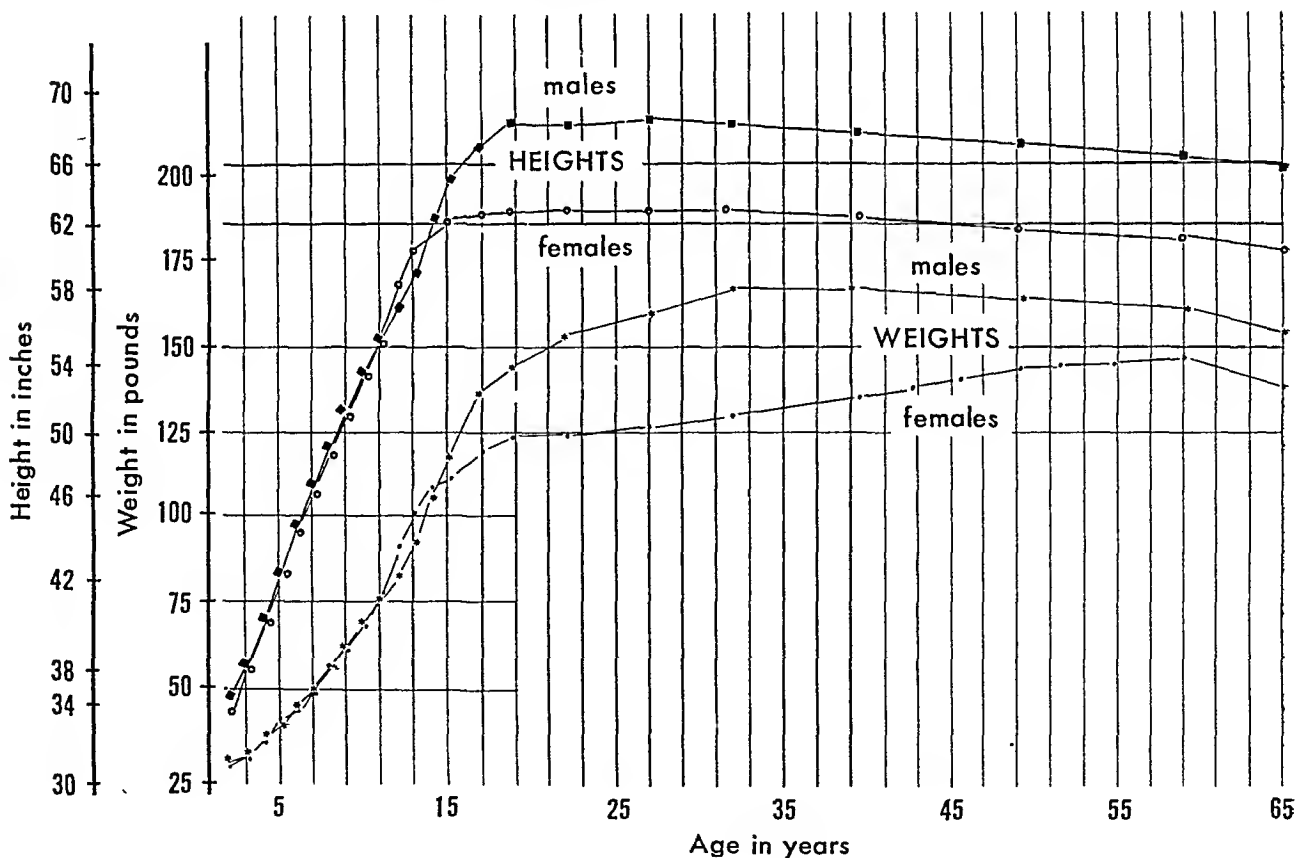
The height-weight averages in the Canadian survey confirm the belief

that in the last 30 years children have been taller and heavier at a given age than their parents were at the same age. However, only the rate at which height is reached has increased; adult weights have not changed a great deal.

Although weights and heights have shown a progressive increase during the past 30 years, the rate of increase has been slower in the last 14 years than in the preceding 16 years. The reasons for this slower rate of increase are not clear, Pett said, but he suggested that several factors may explain it. One of these may be more widespread nutrition education, with greater emphasis on the general effects of a balanced diet than on growth rates.

"I would like to believe that this factor is operating in this slowing down of the averages, because I believe it is the correct approach to a longer and fuller life," Pett stated.

Canadian heights and weights for age.





"Rapid growth may be one of the factors in our increase in degenerative diseases."

Average weight for adults drops at ages 45-54, climbs again, and then drops, the speaker concluded, and these changes may indicate some fundamental aspects that have not yet been studied. (See chart.)

## Explains Canadian Grants For X-ray Services

As one means of providing better diagnostic services in Canada, the Canadian Government in 1953 established a laboratory and radiological services grant, reported F. W. Jackson, M.D., director of health insurance studies, Department of National Health and Welfare, Ottawa.

The purpose of the grant is to assist the Provinces in providing laboratory and X-ray diagnostic services, purchasing equipment, training personnel, and conducting surveys and studies. The amount of the grant, to be matched by each Province, is 30 cents per capita the first year, increasing by 5 cents each year to a maximum of 50 cents per capita.

Jackson defined laboratory and X-ray diagnostic services as "those procedures which are ordinarily requested by a registered medical practitioner and performed by workers employed in institutions approved by the Provincial authority for the purpose of assisting the physician to diagnose the presence, absence, or status of disease, defect, or disability."

The grant will make more and better diagnostic services available throughout the Provinces, Jackson said, and will save time and money for the patients because the services will be available close to their homes.

### Physician's Role

Services financed by grant funds must be provided to the public at not more than cost, Jackson said. He stressed the fact that the traditional physician-patient relationship is to be maintained and said that there

has been no thought of regimenting or centralizing personal health services. Rather, the objective is to strengthen the physician's hand and thus to bring greater and more direct assistance to the people themselves.

Jackson reported that the Manitoba Deputy Minister of Health had stated that in that Province the laboratory and radiological services grant had proved to be an inducement to the young and modern medical practitioner to practice in rural areas, had raised standards of service in rural hospitals, and had made the advantages of modern scientific diagnostic services accessible at reasonable cost.

## New Approach Might Aid English Problem Family

Recruitment of experienced area rehabilitation officers to supplement the practice of using health visitors and other academic social workers was strongly advocated by a British health officer as a possible way of coping with the problem of derelict families.

H. C. Maurice Williams, Dr.P.H., the medical officer of health for Southampton, England, said that despite the education, housing, and income available to the working class family today, England still has the problem of "submerged families." These families, with histories of ignorance, poverty, and vice, number an average 2.98 per 1,000 families.

"It is little wonder that when a family has to perform every function of life within the confines of a room 14 feet by 12 feet they degenerate," he remarked.

### The Misfit Groups

Socially misfit families can be broadly divided into three groups, according to Williams, even though there is no well-defined common yardstick of measurement.

One group shows affection for the children. These children are supplied with sufficient but unsuitable

food. The mother has many pregnancies and is completely unable to cope with the routine work of domestic life. The father fails to encourage his wife. His laziness and long record of unemployment, Williams felt, does not disturb him so long as he can receive from public assistance arrangements almost as much money as he would if he went to work. If caught in the early stages of degeneration, this group is capable of rehabilitation, Williams stated.

The father and mother in the second group, although usually educated above their station, have a low moral sense and no concern for their children's welfare or their legitimacy. Living conditions are satisfactory for the third group, but these parents are the ones who subject their children to physical cruelty. Fortunately, they are in the minority.

"The only satisfactory method of dealing with so-called problem families is as a family unit," Williams stated. The area rehabilitation officers he recommends for preventing family deterioration would be men and women experienced in life, who would mix intimately with the people of a locality, visit the public houses, and while there, in conversation and gossip, ascertain the potential families who are rapidly going downhill. The health visitor should come into the picture when the family has been returned to some degree of normality and when they are receptive to advice and health education, he added.

### Other Solutions

Two other approaches of working with the problem family as a family unit were described by Williams. In Southampton, a few derelict families were selected to see whether the altering of their circumstances would help them change their standard of living. Constant visitation and advice, the promise or provision of rehousing, and help toward getting furniture have proved to be some excellent means of bringing about rehabilitation. Although this method



at first sight appears fairly costly, it is far cheaper than leaving the problem untackled, he commented.

The Mayflower Home operated by the Salvation Army in Plymouth, England, is a pioneer experiment. Commitment to the home is offered as an alternative to prison sentence. Mothers live there with their children and may be visited by their husbands. The prevailing assumption is that a wholesome, nourished body is more responsive to spiritual correction than an unclean and unfed one. The first lesson begins in the bathroom. Then the women are taught simple rules of housewifery and the importance of adhering to a methodical, daily routine. On completion of their daily tasks, they are free to visit the local cinemas and tearooms.

The schools should pay more attention to the teaching of housewifery and domestic responsibilities, Williams believes. Children of problem families could be selected for additional instruction and the curriculum adjusted to this end.

## Infant Mortality Pattern Noted in English Study

A rise in postneonatal mortality with the mother's parity has been noted in a current study in England.

Reporting this and other studies of the social medicine research unit, Medical Research Council, London, was J. N. Morris, D.P.H., director of the unit.

This rise, Morris specified, occurs in each age group, but it is sharper among younger women. The trend is evident in the different social classes, indicating that it is not simply a matter of young mothers with large families being more common among the poorer classes, he added.

Analysis by cause of death shows that the pattern is accounted for by the deaths from "environmental" causes—infectious and accidents, he stated.

This study, a joint inquiry with

the General Register Office, is concerned with the 1½ million births in 1949 and 1950 in England and Wales and the 80 thousand stillbirths and infant deaths among them. It is mainly a theoretical exercise in social biology, Morris explained, but he said that immediately practical results may also emerge. For example, it may be of value in the identification of "vulnerable" groups requiring particular attention from public health services.

## Duodenal Ulcer

From a study of the family situation of 32 men aged 16 to 25 years who have duodenal ulcer, Morris reported the following: Mothers of these men tend to be dominant in the home; to have overprotected, overrestricted, and overindulged their sons; and to have an unusually great amount of psychosomatic disorder.

The objective of this study, he noted, is to try to identify patterns of family relations and of child upbringing which may be connected with the development of ulcer. In his opinion, one of the greatest needs in social-medical research today is to develop working partnerships with the social sciences and psychiatry.

Another study is trying to learn what is happening in the field of general practice. Essentially an essay in method, this study has found, Morris reported, that the general practitioner spends almost one-half his time dealing with serious, mostly chronic, disease. It has also found that about 13 percent of all their work is concerned with bronchitis, he said, a finding of interest in connection with the increased attention in the United Kingdom to respiratory disorders and atmospheric pollution.

## Outlines Control Measures For Australian Zoonoses

Hydatid disease, Q fever, brucellosis, leptospirosis, psittacosis, and arthropod-borne encephalitis are the

important zoonoses in Australia. The fact that hydatid disease is still a problem—affecting 40 percent of farm and sheep station dogs—indicates its continued importance in public health, said A. R. Southwood, M.D., director general of public health for South Australia.

Southwood based his information on reports given to the 1953 Australasian Science Congress and on his observations as a member of the Australian National Health and Medical Research Council.

Effective cooperation of veterinarians, entomologists and other zoologists, epidemiologists, laboratory experts, and practicing physicians is necessary to prevent epizootics, he said. In the field of zoonoses, more than in any branch of medicine, it is necessary to study the ecology of the animal, the pathogen, the vector, and man, he continued.

## Hydatidosis

Wider use of educational methods was urged by Southwood for the control of hydatid disease rather than attempting to police laws, such as those restricting the number of dogs.

Hydatid disease is responsible for about 50 deaths a year among Australia's 8 million people, he stated. The amount of illness it causes is hard to estimate, but for a disease so easily controlled, any amount is too much, he noted.

The country has patterned its control program on Iceland's campaign of public education, better control of slaughtering, and veterinary inspection of all meat. Control measures also include the anthelmintic treatment of dogs once a year. Arecoline hydrobromide, properly used, clears dogs of infestation, but no drug treatment is effective against the hydatid cysts, Southwood said. Surgery may be resorted to when the disease occurs in humans.

## Other Zoonoses

In discussing control measures for the leading zoonoses, he said:

Many of the zoonoses have a typical occupational bias and are manifested in man by vague illnesses and little fevers, making accurate diagnosis difficult. Human sufferers respond well to some of the antibiotics. Q fever patients are effectively treated with chloramphenicol or aureomycin. In treating psittacosis, aureomycin or terramycin is preferred to penicillin, although large doses of penicillin are efficacious. Aureomycin arrests undulant fever attack, but relapses are common.

Q fever in man probably occurs more often by inhalation of dust from hides which carry dried feces of the infected cattle ticks than through skin contact with infected beef. Preventive measures include control of the common animal reservoirs, of air contamination, milk supplies, and of

exposed individuals by means of protective clothing, respirators, immunization.

The spread of brucellosis would be stopped by the vaccination of all young cattle, sheep, goats, or swine, the elimination of all infected animals, and the pasteurization of all milk supplies.

Leptospirosis should be controlled by the destruction of rats; the elimination or treatment of infected pigs and dogs; the control of moist conditions favorable to leptospirae, including the proper drainage of canefields, cowyards, and piggeries. Since the organisms can survive in mud and water, people should wear protective clothing, such as waterproof boots, overalls, and gloves, and avoid swimming in infected water.

cedures were broken down into the referral standards of their separate component parts: The Snellen component of the Massachusetts test was compared with Snellen testing by the Oregon teachers and by trained test consultants. Conclusions drawn from the study were based on 3,775 Massachusetts tests, 3,104 reports of teacher findings, and 365 similar Snellen-observations made by an experienced operator testing the control group. Some of the findings were:

The Massachusetts test is an effective case-finding method, justifying 75 percent of its referrals. It disclosed more than twice as many probable defects of vision as were found on teacher screening. Its highest efficiency lies in the Snellen component, which yields 61 percent of all failures and is confirmed by professional examination in 84 percent of the cases referred. The plus lens and Maddox rod components are less selective, but provide a battery of tests whereby the more elusive visual defects may be brought to examination. Approximately 66 percent of these will require care in the combined judgment of physicians and optometrists.

The Snellen-observations made by the trained operator disclosed the same percentage (16.7) of probable defects among the children as did all parts of the Massachusetts test (16.6), indicating close correspondence in the case-finding potential of the two methods when given by experienced operators.

Screening by the Snellen test plus teacher observation is not to be disparaged as a case-finding method, but it has not reached its full potential in the Oregon schools. Only rarely were teacher observations recorded on the school health records so that the failures in the teacher-screened group were essentially Snellen test failures—thus, only comparable to failures to pass the Snellen component of the Massachusetts test.

Still to be investigated is how large a percentage of cases referred

## Vision and Hearing Testing . . .

*How effective the Massachusetts vision test is in identifying school children who need visual care and how the test compares with one State's school vision screening procedure can be determined from the Danbury and Oregon studies. Also discussed is the first attempt at citywide testing of preschool youngsters for hearing.*

### Oregon Compares Snellen And Massachusetts Tests

Will the Massachusetts vision test disclose more or fewer vision defects than are found by the practice, current in Oregon, of having teachers give the standard Snellen test and report observed signs of poor vision?

If a trained test operator gives the Snellen test and makes similar observations, how will the defects found compare with those disclosed by the Massachusetts test?

Will the probable defects uncovered as a result of any one of these

three procedures justify referral, in terms of correction or care recommended on professional eye examination?

These basic questions were posed as the objectives of a study of vision screening made in 1953-54 by the Oregon State Board of Health and reported by Eleanor B. Gutman, M.D., M.P.H., director of the board's vision conservation section.

Gutman pointed out that continued controversy over school vision screening stimulated comparison of Oregon procedure with the widely used Massachusetts test. For comparative purposes, both testing pro-

for examination on observed signs and symptoms alone will warrant treatment for specific defects.

## Hearing of Preschoolers Tested in Buffalo

As a byproduct of summertime availability of 3 full-time audiometric technicians, a preschool hearing screening program was launched 4 years ago in Buffalo and rural Erie County, N. Y. Since then, 125 hearing clinics have been held in conjunction with topical fluoride clinics for preschoolers, at testing sessions in the schools on registration day, and at well-publicized special clinics.

In describing this first attempt at mass testing very young children with a pure tone audiometer, Buffalo's deputy health commissioner, William E. Mosher, M.D., M.P.H., and Adfur E. Maines, M.D., director, school health service, said delaying the initial screening of children until the second grade can no longer be justified.

The Buffalo school schedule now calls for testing youngsters on entering kindergarten or first grade. This procedure has the advantage of early detection of hearing impairment and outweighs the possible limitation of individual screening tests in the older age groups.

The techniques used in Buffalo have proved effective, practical, and relatively inexpensive, Mosher and Maines asserted. The only major expense has been the salaries of the trained technicians. In their hands, the tests can be performed with sufficient accuracy to isolate a significant percentage of hearing losses among the test group. Repeat threshold tests under ideal conditions at the Buffalo Speech and Hearing Center have compared very favorably with the results of the field tests.

If a daily clinic attendance of 35 children could be maintained, it should be possible to test about 1,200 children in a 7-week period, the health officials believe. This esti-

mate takes into consideration the time devoted to the uncooperative child as well as the time-consuming threshold tests.

### *Screening Techniques*

More than 5,000 children, 90 percent of them under 6 years and some

as young as 2, have so far been given the individual pure tone sweep test at speech range frequencies. Because of the high noise level in many of the testing rooms and the difficulty of getting young children to cooperate the 20-decibel hearing level was used. When a child failed to hear

## Recent Advances in Rabies Control

When two dogs attacked a group of children going home from school last June, some of the children were bitten severely on the head and neck. Others suffered minor cuts and bruises. One dog had to be shot through the head. The other was taken into custody.

This attack started an imaginary rabies outbreak in the Republic of Neutralia, an imaginary country. The topic opened a panel discussion on rabies control at the 1954 Conference of Public Health Veterinarians.

On the basis of this hypothetical situation, the members of the panel outlined a control program and described in detail the steps necessary for the diagnosis of rabies in a biting animal, such as a period of observation, laboratory examination of the head for Negri bodies, mouse inoculation test.

Attention then turned to control measures, of which the most important, they agreed, is the vaccination of at least 70 percent of the dog population.

Next, the problem of wildlife rabies was considered. The reduction of species known to be particularly likely to spread the disease, such as foxes, was recommended, and the need for further study of rabies in wild animals was emphasized. Rabies in bats, recently given much publicity, was described as deserving additional investigation.

The discussion concluded with a brief report of results in the treatment of humans with rabies antiserum and a preliminary statement about the use of chick embryo adapted live virus for the prophylactic vaccination of man.

Hilary Koprowski, M.D., was panel moderator. He is assistant director of viral and rickettsial research for Lederle Laboratories, Pearl River, N. Y. The speakers were:

Ernest S. Tierkel, D.V.M., director, rabies control activities, Public Health Service, Atlanta; Donald J. Dean, D.V.M., veterinary consultant, New York State Department of Health; Leland E. Starr, D.V.M., public health veterinarian, Georgia Department of Public Health.

Also: John P. Fox, M.D., professor of epidemiology, Tulane University School of Medicine, and T. F. Sellers, M.D., director, Georgia Health Department.

2 or more of the test frequencies in either 1 or both ears at that level, and this was confirmed by a full threshold acuity test, he was considered a verified hearing loss and referred to a family physician, private otologist, or to a hospital hearing clinic.

Sixty-three children (1.2 percent) were found to have a verified hearing loss. Medical and educational recommendations were made for 44 children; 2 were recommended for further observation; and 7 were reported to have normal findings. Conductive deafness was the diagnosis in 30 cases, and nerve deafness in 2. Other causes of hearing loss included allergy, wax, and foreign body in ear canal. The most common recommendation was removal of tonsils and adenoids. With the exception of 1 deaf mute, hearing loss was not suspected by the parents.

In 1954, an effort was made to recheck all children found to have a verified hearing loss during the earlier clinics. The majority were found still to have a significant impairment at the time of the recheck audiogram.

## Describes Danbury Study Of Massachusetts Test

How effective is the Massachusetts vision test in identifying the children whom ophthalmologists and optometrists find to need visual care?

Like any other screening process, vision testing has inherent errors of under-referral and over-referral, said Hollis M. Leverett, vision consultant, American Optical Company, Southbridge, Mass.

Although it is expected that some children who need attention may not be identified by screening and that others who do not need care may be referred for professional examination, reasonable efforts should be made to minimize these errors, Leverett stated. In his opinion, the criteria for referral and the adequacy

of testing in the schools are crucial factors.

Leverett, who guided the design of a new experimental model of the Massachusetts vision test, conducted the Danbury, Conn., school vision screening. This study is part of a broader program to evaluate the test and to improve the efficiency of the instrument and the test routine in the schools.

Each child was tested carefully. Those who failed were given a second opportunity to take the test. On the assumption that the children who could pass the second test would have constituted errors of over-referral, the retest procedure has obvious and crucial value, he remarked.

After describing standards for failure, which varied with the grade, procedures of referral for children not wearing glasses, and how recommendations were obtained from doctors for children wearing glasses, he summarized the results of the study:

For children tested through the glasses worn, it was found that 56 percent failed the first test and 45 percent failed both tests on retesting.

For children who did not have glasses, it was found that 20 percent failed the test and 12 percent failed both test and retest.

### *With or Without Glasses*

Leverett said that the evidence presented makes it clear that the test performance of school children is subject to considerable variation. Eleven percent of the children wearing glasses and 9 percent of the children who do not have glasses change performance from fail to pass on retest.

Test results for children wearing glasses and for children not wearing glasses indicated marked differences in performance, chiefly, in test failure rate, rate of change from fail to pass on retest, and variations of failure rate with grade. Because of these variations, he believes it undesirable to apply the usual testing and referral practices to both groups.

Despite improved vision made possible by lenses, a large proportion of children wearing glasses were unable to meet the screening test standards, he stated. About 45 percent failed both test and retest.

Leverett considered the failure rate for children wearing glasses not surprising. Some have deficiencies which cannot be corrected to the level of test requirements. Others have deficiencies such that correction to that level is not desirable.

Inquiries were made to determine the visual care status of the children who were wearing glasses, Leverett reported. The doctors' reports indicated that, following the inquiries, 88 percent of the group had been examined within a 2-year period. A reexamination was considered desirable for 43 percent. Only 29 percent arranged reexamination as a result of the inquiries made.

It was Leverett's impression that, with slight modification, the inquiry procedure could be made exceedingly effective in encouraging the desirable periodic examinations for children who are under professional care.

Leverett said that the children not wearing glasses who failed the test were referred for a complete visual examination. The doctors' reports on these referrals indicated that:

For 72 percent, visual care was needed and prescribed.

For 23 percent, professional attention was indicated although visual care was not prescribed.

For 5 percent, no visual deficiency was identified.

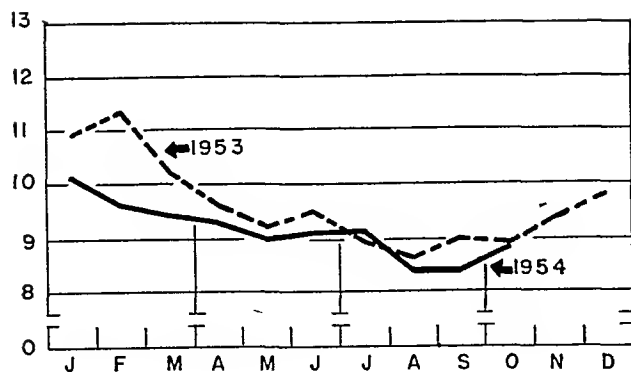
Leverett noted that the criterion adopted to designate a "correct" referral would make a difference in the statistics.

If the immediate need for visual care were adopted as the criterion, 72 percent of the referrals were correct and 28 percent in error, he said.

But if the need for visual care or the doctor's opinion on the need for professional attention were the criterion adopted, 95 percent of the referrals were correct and only 5 percent in error, he said.

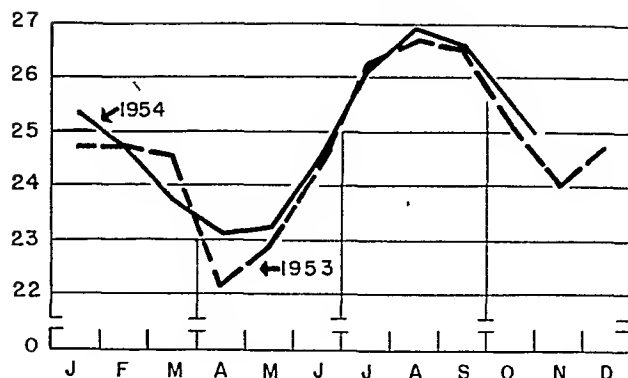
## Deaths

per 1,000 population



## Births

per 1,000 population



# United States Vital Statistics, 1953-54

A new high for births and a new low for deaths appear very likely for 1954. Thus, the natural increase in the population of the United States—that is, births minus deaths—should be greater than for any previous year. Marriages in 1954 continued the decline which has been almost continuous since 1946. Divorces, which decreased sharply in the early postwar years, appear to be leveling off. These statements are based on provisional figures for States shown in the *Monthly Vital Statistics Report* for January–October 1954. Each month the figures are sent by State and local officials to the National Office of Vital Statistics, where they are used to obtain United States estimates.

## Births

During the first 10 months of 1954, an estimated 3,344,000 births were registered, exceeding the number in these months of 1953 by 2.5 percent. If this lead is maintained for the rest of the year, about 4.0 million births will be registered, making 1954 the fourth successive

record-breaking year. Including unregistered births, the total will be 4.1 million.

In each year since the end of World War II, births have been at a considerably higher level than during the war or the immediately preceding years. Rising sharply after demobilization, the birth total (adjusted for under-registration) climbed from 2,858,000 in 1945 to a peak of 3,817,000 in 1947. It dipped slightly in 1948 and leveled off during the next 2 years. In 1951 the number of births again increased, and continued to rise in 1952, 1953, and the first 10 months of 1954.

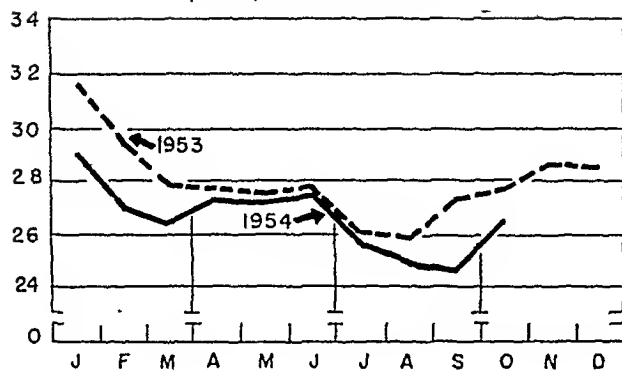
The birth rate per 1,000 population in 1953 was 25.1, and, according to present indications, will increase slightly—to 25.2—in 1954. The latter figure is the second highest in 28 years, and is only 5.3 percent below the postwar peak (26.6) in 1947. In 1940, by comparison, it was 19.4, and during the depression of the 1930's, it had dropped to 18.4.

Much of the increase in births in 1953 and 1954 can probably be attributed to a continuing rise in the number of third, fourth, and fifth children. Data on birth order for these years are not yet available, but it is not expected that they will show an increase in the number of first births because of falling marriage rates since 1951.

*Prepared by the National Office of Vital Statistics, Public Health Service.*

## Infant Deaths

per 1,000 live births



The seasonal variation in the birth rate during 1953 and in the first 10 months of 1954 was quite marked and closely resembled the pattern in previous postwar years. The rates for the first 3 months of 1953 formed a minor peak. This was followed by a sharp drop in April to the year's low of 22.0. In the next few months, the rate rose to a high of 26.7 (in August) before declining again. In past years, the birth rate has generally dropped at the end of the year. However, between November and December 1953, there was a rise of 2.5 percent. These measures are not adjusted for under-registration because of the negligible effect of this factor on changes from month to month.

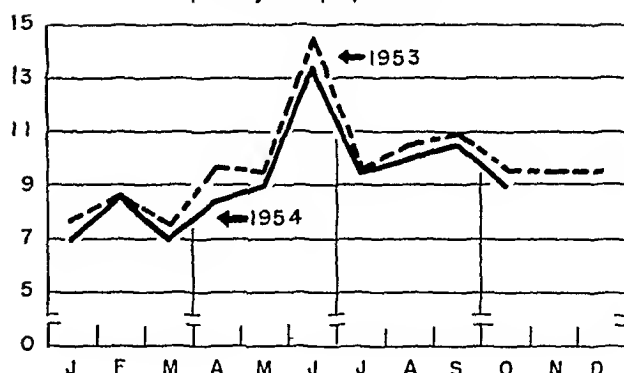
## Deaths

During the past 5 years, 1949-53, the death rate has remained nearly stationary, varying only between 9.6 and 9.7 per 1,000 population. This pattern will be changed in 1954, judging from the unusually favorable mortality experience of the first 10 months. For the period January through October, the death rate (on an annual basis) was 9.1 for 1954, compared with the previous low of 9.6 recorded for 1950, 1951, 1952, and 1953. Unless mortality for the remaining 2 months should be unexpectedly high, the death rate for 1954 will be either 9.2 or 9.3.

The infant mortality rate (the number of deaths under 1 year per 1,000 live births) promises to be lower in 1954 than the year before, continuing the general downward trend. This rate

## Marriages

per 1,000 population



for January-October was 26.6 in 1954, compared with the previous low of 27.9 in 1953.

The outstanding feature of the year 1954 was the absence of any reported outbreak of influenza. In each of the previous 4 years, there was an outbreak of influenza in the early part of the year. The most severe was in January and February of 1953, and the accompanying chart shows the very large number of deaths resulting from the widespread occurrence of influenza and other acute respiratory infections. The year 1954 was the first since 1949 in which no outbreak occurred, and as a consequence the death rates for the chronic cardiovascular diseases, as well as for influenza and pneumonia, have been relatively low.

## Marriages

During the first 10 months of 1954, fewer marriages were reported than in the same period of 1953, and the marriage rate declined from 9.7 to 9.2 per 1,000 population. In previous years, the estimated marriage rates for the January-October period, based on provisional figures, have not varied greatly from the rates for the entire year, based on final returns.

The decline in marriages may in part be attributed to the low birth rates of the 1930 decade, with the result that there are fewer young people of marriageable age in the present decade.

Monthly estimates of marriages in the United States are based on figures on marriage licenses, intentions of marriage, and marriages by reporting month, available from the individual

# Vital statistics: United States, 1952, 1953, and January–October 1954

Item	January–October			January–December		
	1954	1953	Percent change	1953	1952	Percent change
Number						
Live births:						
Registered.....	3,344,000	3,262,000	+2.5	3,909,000	<sup>1</sup> 3,846,986	+1.6
Adjusted for under-registration.....	3,389,000	3,314,000	+2.3	3,971,000	<sup>1</sup> 3,913,000	+1.5
Marriages.....	1,227,000	1,282,000	-4.3	1,533,000	1,539,318	-.4
Deaths.....	1,221,000	1,263,000	-3.3	1,519,000	1,496,838	+1.5
Infant deaths.....	88,400	90,500	-2.3	109,100	109,413	-.3
Rate						
Live births:						
Registered.....	25.0	24.8	+0.8	24.7	<sup>1</sup> 24.7	0
Adjusted for under-registration.....	25.3	25.2	+.4	25.1	<sup>1</sup> 25.1	0
Marriages.....	9.2	9.7	-5.2	9.7	9.9	-2.0
Deaths.....	9.1	9.6	-5.2	9.6	9.6	0
Infant deaths.....	26.6	27.9	-4.7	28.0	28.5	-1.8

<sup>1</sup> Based on a 50-percent sample.

NOTE: Deaths are exclusive of fetal deaths and of deaths among armed forces overseas. Data are final for 1952, and are estimated for 1953 and 1954. Birth, death, and marriage rates are per 1,000 population excluding armed forces overseas; infant mortality rates are per 1,000 live births and are adjusted for the changing numbers of births. All rates are on an annual basis. Population figures were furnished by the Bureau of the Census.

States. The estimating procedure is described in the January 1954 issue (vol. 3, No. 1) of the *Monthly Vital Statistics Report*.

## Divorces

Figures on divorces available on a current basis from 25 areas show that the numbers of divorces in the first 9 months of 1954 are lag-

ging about 4 percent behind comparable totals for 1953. For 21 areas, the 1953 total was almost identical with that for 1952. During 1952, the estimated number of divorces and annulments in the United States was 392,000, and the rate was 2.5. This is in marked contrast to 1946, when divorces were estimated at 610,000 with a rate of 4.3 divorces per 1,000 persons, the largest number and rate for any year on record.

PHR

# Physical Activity And Arteriosclerotic Heart Disease

By PERCY STOCKS, M.D., D.P.H.

A POSSIBLE association between locomotory habits and arteriosclerotic heart disease has been suggested by results of studies of death rates in recent years, according to occupation, for coronary disease and for myocardial disease. Also, a rise in death rates for arteriosclerotic heart disease has accompanied an increasing use of the motorcar and has been noted particularly among those classes of men who use motorcars most and tend to walk least. I would suggest that statistical studies be planned in several countries aimed at obtaining more evidence to prove or disprove the hypothesis that lack of exercise may encourage the onset of coronary occlusion.

Recent research suggests that lipoid metabolism may be concerned in the etiology of atheroma. However, when atheroma is lethal it is usually because occlusion supervenes—and the determining factors for occlusion may have little to do with diet. It is not unreasonable to suppose that when the coronary arteries are

*Statistical studies are needed to investigate the possibility, suggested by mortality figures for various occupations in England and Wales, that physical activity tends to protect the middle-aged from acute coronary occlusion.*

atheromatous, it is the mechanics of the circulation rather than the chemistry of the blood which decides whether obstruction occurs in a large branch with resulting coronary crisis or in peripheral branches with more gradual myocardial degeneration as the outcome.

It has been observed that among men whose social conditions were most favorable, degenerative heart disease tended to express itself as coronary disease or angina pectoris, whereas at the other end of the social scale, where occupations involving hard physical work predominated, heart disease tended to take forms described on death certificates as myocardial degeneration (1). In 1951 I pointed out (2) that, although one-seventh of the 4,000 deaths attributed to coronary and myocardial diseases among navvies, coal hewers, dock laborers, and agricultural laborers were certified as due to coronary disease or a synonym of it, that proportion became greater with decreasing physical activity in the occupation. For example, the proportion of coronary to total myocardial and coronary disease was about one-quarter for metal machinists, printers, retail salesmen, sorters, and farmers, and nearly two-fifths for teachers, clerks, bankers, and administrative officials.

Morris and his associates (3) have now followed this up with a more detailed statistical study of the deaths in 1930-32 among 2½ million men aged 45-64 in social classes III to V, which comprise the skilled artisans, partly skilled workers, and unskilled workers. The occupations were classified into three groups, designated as physically heavy, physically light, and intermediate or doubtful jobs

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*This paper was presented before a session on arteriosclerosis and cardiac diseases at the International Congress of Clinical Pathology in Washington, D. C., September 7, 1954.*

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within each social class. At each age period, 45-54 and 55-64, the coronary disease death rate was about twice as great for persons in physically light occupations as for those in the heavy occupations. For death rates from valvular, myocardial, and cerebral vascular lesions and arteriosclerosis without heart affection, no differences of importance were found between the physical activity groups. The same investigators also found from a careful study of early mortality rates from coronary disease during 1949-52 among bus conductors, bus drivers, postmen, and telephone operators working in the same areas of London that the death rate was lower among conductors than among drivers and lower among postmen than among telephonists. All this lent support to the hypothesis that in middle age physical activity tends in some way to protect the individual against coronary occlusion in an acute form.

#### Deaths Among Amputees

In 1951, an Advisory Committee on Cardiovascular Disorders and Mortality Rates in Amputees, appointed by the Ministry of Pensions in London, prepared an interim report on a statistical analysis of the subsequent histories of men who had lost one or more limbs in World War I.

In that study, for the 5 years 1945-49, the causes of death of a representative sample of more than a thousand men who had suffered a single lower limb amputation during World War I were compared with a control group of corresponding age distribution who had suffered from wounds without an amputation. The deaths attributed to coronary and myocardial disease combined formed practically the same percentage of all deaths in the two groups, but the ratio of coronary disease to myocardial disease within the combined total was higher among the amputees than among the controls. Although this was not generally accepted by the committee as having any significance, my personal opinion, expressed in an appendix to the report, was that there was probably a connection between these ratios and

the restricted physical activity of amputees. The recent work of Morris and his co-workers (3) has not caused me to change that opinion.

It has been suggested that the long-continued physical and emotional stresses and privations such as were experienced in the First World War both by men in the services and by civilians might have been a factor in the subsequent increase in coronary disease mortality; but such an idea is not incompatible with a favorable effect of regular physical exercise which involves no nervous stress.

#### Deaths Among Athletes

A recent paper by Rook (4) gives the result of comparing the mortality experience of 772 Cambridge University students who had taken an active part in sports while at the university with that of 710 men who had not done so. No evidence emerged that the sportsmen died at an earlier age than the control group; in fact, if allowance is made for their rather higher proportion of deaths from violent causes, the reverse must have been the case with respect to death from natural causes. Out of 387 deaths from nonviolent causes at ages under 65, when the certified cause of death was known, 9.3 percent of the sportsmen were said to have died of a cardiovascular condition compared with 12.1 percent of 289 in the control group. Because many of the deaths occurred before 1920, no more precise division of the heart conditions could be made; but at least this finding is not incompatible with the hypothesis.

#### REFERENCES

- (1) Great Britain. Registrar General: Decennial supplement, England and Wales, 1931. Part 2A. Occupational mortality. London, His Majesty's Stationery Office, 1938.
- (2) Stocks, P.: Coronary disease and modern stress (letter to editor). *Lancet* 260: 351, Feb. 10, 1951.
- (3) Morris, J. N., Heady, J. A., Raffle, P. A., Roberts, C. G., and Parks, J. W.: Coronary heart-disease and physical activity of work. *Lancet* 265: 1053-1057; 1111-1120, Nov. 14 and 15, 1953.
- (4) Rook, Sir Alan: An investigation into the longevity of Cambridge sportsmen. *Brit. Med. J.* No. 4865: 773-777 (1954).

# Gonorrhea Detection by Urine Examination

By S. ROSS TAGGART, M.D.

**A**N INTENSIVE epidemiological and public educational program directed toward gonorrhea control has been disappointing because it has not been successful in rapidly reducing the number of cases of gonorrhea being reported. If control is to be accelerated, additional case-finding measures must be established.

In hospitals, clinics, and physicians' offices, urine specimens of large numbers of patients are routinely examined for albumin, sugar, and so on. If, at this same time, gonorrhea could be found by examination of these urine specimens, an economical and simple case-finding aid would be available; a rapid screening procedure for detection of gonorrhea suspects would be provided. This paper presents the results obtained in a preliminary study of macroscopic inspection and microscopic examination of the sediment of urine specimens for the detection of gonorrhea in patients from a selected clinic group and from an unselected screening line group.

## Methods

Urine specimens were collected in flat-bottomed specimen bottles. One to two cubic centi-

meters of 10-percent acetic acid was added to the fresh urine specimens, which were then macroscopically inspected. An opinion was recorded as to the presumptive presence of pus or shreds in the urine specimen. If shreds or pus were present, the specimen was considered presumptively positive for gonorrhea.

The urine specimen was then allowed to sit for at least 1 hour. After this period it was decanted and a spread was prepared from the sediment. The spread was air-dried, stained with a Gram's stain, and examined under an oil-immersion lens for the presence of gram-negative intracellular diplococci. Urine specimens which had been allowed to stand for any period before initial visual inspection were swirled before acidifying and then were allowed to stand for at least an hour before microscopic examination of the sediment.

When a microscopically positive sediment was found in a urine specimen and a diagnosis of gonorrhea had not been established in the patient prior to the urine test, the patient was re-examined bacteriologically. The diagnosis of gonorrhea was established or confirmed in all patients with positive sediment findings by urethral or cervical spread or, if indicated, by culture.

## Results

The selected population group consisted of male patients who were examined in a venereal disease clinic. Of this group, 68 had a frank urethral discharge in which gonococci could be demonstrated. Using the test technique de-

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scribed in this paper, 52 of these 68 patients, or approximately 75 percent, were found to have gram-negative intracellular cocci in the sediment of their urine specimens; these urine specimens also had been considered positive for gonorrhea by sample inspection, utilizing the technique described for screening. Thirty-two of these venereal disease clinic patients had no urethral discharge and had been considered clinically negative both by history and physical examination. However, in 3 of the patients (approximately 10 percent), positive findings in the sediment were obtained by microscopic examination (2 were positive and 1 was negative by macroscopic inspection). These diagnoses of gonorrhea were confirmed by bacteriological study of urethral scrapings.

In order to determine the effectiveness of this simple macroscopic technique under conditions in which patients were not appearing primarily for venereal disease diagnosis and treatment, it was applied to a different type of patient body. This group consisted of patients of the outpatient service of the District of Columbia General Hospital. Urine specimens from these patients are collected routinely as a part of their initial examination. These patients were being seen for various medical and surgical complaints, and without this examination would have been considered free of gonorrhea. The

urine specimens were examined by the test technique under consideration and the discovery rate of gonorrhea in this group was 15.0 percent in the males and 6.8 percent in the females. Demonstration of gonococci by urethral or cervical spread or culture was possible in all of these patients. Because this study was of a preliminary investigative nature, sugar fermentation studies for definitive bacteriological diagnoses were not considered necessary at this time.

The findings obtained in both groups are presented in the accompanying table.

### Discussion

The results of this study of the detection of gonorrhea suspects by macroscopic examination of the sediment of urine specimens appear encouraging, and suggest the desirability of further study to determine whether this method might become practicable.

It would appear that a technique of macroscopic inspection followed by microscopic examination of sediment of presumptively positive urine specimens will establish a diagnosis of gonorrhea in approximately three-fourths of an infected group.

Culturing the urinary sediment of all patients would no doubt have raised the percentage

**Results of macroscopic and microscopic examination of urine specimens from a selected clinic population group and an unselected screening line group**

Type of patient	Total		Macro-positive, micro-positive		Macro-negative, micro-positive		Macro-positive, micro-negative		Macro-negative, micro-negative	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Selected venereal disease clinic group										
Male:										
Urethral discharge positive for gonorrhea.....	68	100.0	52	76.5	0	0	3	4.4	13	19.1
Urethral discharge absent.....	32	100.0	12	6.3	1	3.1	1	3.1	28	87.5
Unselected screening line group										
Male.....	120	100.0	16	13.3	2	1.7	6	5.0	96	80.0
Female.....	177	100.0	12	6.8	0	0	10	5.6	155	87.6

<sup>1</sup> Diagnosed bacteriologically as having gonorrhea, subsequent to presumptive diagnosis of gonorrhea based on examination of urine specimens.

of infected persons found. However, the technical difficulties and increased cost entailed by this procedure would, in most cases, not be warranted. Of greater significance to the gonorrhea control program is the fact that a simple method of screening large numbers of individuals who are infected with gonorrhea, but who have not been motivated to seek specific medical care, should be of value in the public health control of gonorrhea. From experimental inoculation studies with gonorrhea it is known that not all patients have the profuse outpouring of pus and urethral discomfort that are considered characteristic of the disease. It is this group, not sufficiently disturbed by the infection to seek specific care, which might be discovered, especially if the portion of the population in which the prevalence of gonorrhea might be expected to be high were screened.

The finding of an infection rate of 15 percent among a clinic group consisting of patients who were not destined for a type of examination which could be expected to bring them to treat-

ment for gonorrhea suggests the potential importance of this simple method of urine examination. It would appear that the preliminary studies herein described are sufficiently valuable to suggest the desirability of further investigation. It is known that gonorrhea thus far has been relatively resistant to various control procedures. In spite of simple, sure cure the disease has not responded to our control efforts in the same way as syphilis. One of the stumbling blocks has been the lack of a simple case-finding device. These preliminary results would seem to merit further investigation.

### Summary

A simple, routine screening procedure for a presumptive diagnosis of gonorrhea by a macroscopic examination of urine samples has been described. In a high-prevalence population, such a technique should be an aid in case finding in a gonorrhea control program.

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## World Health Day, April 7, 1955

"Clean Water for Better Health" is the theme of the seventh anniversary celebration of the World Health Organization.

The "clean water" theme emphasizes the basic sanitary engineering services which construct safe water supplies and sewage disposal systems for the people of the world. United States membership in WHO helps to develop such long-term worldwide health programs. Short-term health programs abroad are promoted by United States health personnel assigned by the Foreign Operations Administration to health ministries.

The clean water program in the United States was estimated in the President's Economic Report to the Congress January 28, 1954, as requiring \$6 billion for water systems and \$9 billion for new sewers and waste facilities by 1960.

Advances in America's clean water program are supported by water pollution control activities of industry and of local, State, and Federal Government agencies. The Water Pollution Control Act of 1948 is the major instrument for coordinating this work. Research on water pollution control is conducted cooperatively by the Public Health Service Robert A. Taft Sanitary Engineering Center at Cincinnati, the National Technical Task Committee on Industrial Wastes (supported by private industry), by universities, and other institutions.

# Mortality and Marital Status

By DEWEY SHURTLEFF, M.P.H.

A NUMBER of analyses have shown that married people live longer than single people. The most recent analysis published for the United States was for 1940 (1), and the figures clearly showed the lower mortality rates for the married population. In the years since 1940, there has been a tremendous change in mortality rates and a distinct increase in the married proportion of the population. In the light of these changes, it is of particular interest to reexamine the mortality rates by marital status based on the 1950 census.

## Population Base

In the 1950 census (2), data on marital status were based on the replies to the question, "Is he (she) now married, widowed, divorced, separated, or has he never been married?" The question referred to status at the time of enumeration. Persons classified as married comprise, therefore, both those who have been married only once, those who remarried after having been widowed or divorced, and persons reported as separated. Those reported as never married or with annulled marriages were classified as single. Since it is probable that some divorced persons were reported as single, married, or widowed, the census returns doubtless

understated somewhat the actual number of divorced persons who have not remarried.

The distribution of the population by marital status for each age-sex group is shown in table 1. Most men were single at ages 20-24 years, but they soon got married; 3 out of 4 men were married at ages 25-29. Two out of three women were married by the time they were 20-24 years old, and at ages 25-29, 4 out of 5 were married. The peak percentage married was 87.1 for men at ages 40-44 and 86.2 for women at 30-34 years. From 35 years on for men and from 30 years on for women the single proportion of the population remained nearly constant, close to 10 percent. The proportion widowed increased with advancing age, much more so for women than for men. The peak percentage divorced was 3.0 for men at ages 50-54 and 3.7 for women at 40-44 years.

## Mortality Data

Marital status at the time of death is reported routinely on the death certificate. Deaths classified in the same categories as the enumerated population are now available for 1949, 1950, and 1951; rates shown in this paper are based on the average annual number of deaths for these 3 years and on the population enumerated in the 1950 census.

The death rates are shown by marital status, age, and sex in table 2. To summarize, if the 1949-51 death rates for age 20 and over by marital status, age, and sex had occurred in a standard population distributed by age like the

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population for each sex enumerated in 1940, taking the expected numbers of deaths for the married as 100, the index numbers would be:

	<i>Single</i>	<i>Married</i>	<i>Widowed</i>	<i>Divorced</i>
Male.....	163	100	185	207
Female.....	124	100	155	155

These figures summarize the mortality differences among the marital classes. The lowest mortality is still found for the married population, the next most favorable in the single group, and the highest among the widowed and divorced. The differences in mortality between the married and the unmarried are greater for men than for women.

### Mortality by Marital Status, Age, and Sex

It is evident from table 2 that all through the age span, for men and for women, the death rates are lower for the married than for the single, widowed, or divorced. For both men and women in every age group 20 years and over, the mortality rank-order of three of the marital classes generally remains the same: the lowest for the married, the next for the single, and the highest for the divorced. The rank-order of the widowed class shifts with advancing age. The death rate for widowers is the highest of the four marital classes at the early ages, but at ages beyond 60 years, the mortality of widowers is less than that of either single or divorced men. A similar pattern holds for women, although the death rates for widows do not fall below that of the divorced until after age 60.

The differences in death rates may be due, in part, to the greater tendency of healthier people to marry. The evidence for selection as a factor in the differences in rates may be seen more clearly by examining the relative differences in rates between the unmarried and the married at each age. Taking the mortality of the married as 100 in each age group, the chart shows the age-specific death rates for the single, widowed, and divorced expressed as percentages of the corresponding rate for the married. The differences are the greatest between married and unmarried men between the ages of 25 and 44. Similarly, the differences between married and unmarried women are greatest between the ages of 25 and 34. Beyond these ages the curves

Table 1. Percentage distribution of the population by marital status, according to age and sex: United States, 1950

Sex and age (in years)	Single	Married	Widowed	Divorced
<i>Male</i>				
20 and over.....	17.0	76.1	4.7	2.2
20-24.....	59.1	39.9	.2	.9
25-29.....	23.8	74.2	.3	1.7
30-34.....	13.2	84.3	.4	2.1
35-39.....	10.1	86.8	.7	2.4
40-44.....	9.0	87.1	1.2	2.7
45-49.....	8.7	86.2	2.1	2.9
50-54.....	8.3	85.0	3.7	3.0
55-59.....	8.3	83.1	5.9	2.7
60-64.....	8.6	79.3	9.6	2.5
65-69.....	8.7	74.0	15.0	2.3
70-74.....	8.3	67.5	22.2	1.9
75 and over.....	7.8	52.4	38.5	1.3
<i>Female</i>				
20 and over.....	11.8	72.3	13.3	2.7
20-24.....	32.3	65.6	.4	1.7
25-29.....	13.3	83.3	.9	2.5
30-34.....	9.3	86.2	1.6	3.0
35-39.....	8.4	85.5	2.7	3.5
40-44.....	8.3	83.1	5.0	3.7
45-49.....	7.9	79.8	8.6	3.6
50-54.....	7.7	75.0	13.9	3.3
55-59.....	7.7	69.1	20.5	2.7
60-64.....	8.2	60.1	29.7	2.1
65-69.....	8.4	48.9	41.1	1.5
70-74.....	9.0	36.6	53.3	1.1
75 and over.....	9.5	18.7	71.2	.6

SOURCE: Table 102 of reference 2.

show a tendency to converge, more so for women than for men. At the older ages there is less difference in mortality between the married and the unmarried. The chart also shows that differences in rates between the married and the unmarried, in each group, are greater for men than for women.

The persistent differences in rates between the married and unmarried suggest that the married state itself may directly affect mortality. However, the available data are not sufficient to shed light on the many questions that would have to be answered before reaching an understanding of the complex factors involved in the differing mortalities of the marital classes.

For each of the four marital classes, as can be seen in table 2, the death rates for men are

higher than those for women in every age group between 20 and 74. The largest relative difference in rate between the sexes appears in each age group under 60 for the divorced and then in each age group 60 and over for the single. The smallest difference appears in each age group for the married. The ratio of the rate for divorced men to that for divorcees climbs from 2.2 at ages 25-34 to 2.9 at ages 45-54 and declines to 1.6 at ages 70-74. The ratio of the rate for bachelors to that for spinsters rises from 1.6 at ages 25-34 to 2.6 at ages 55-59 and then falls to 1.9 at ages 70-74. From 25 to 64 years, in each age group, the rate for widowers is close to double that for widows, and then it declines to 1.5 times at ages 70-74. The death rate for husbands is 1.4 times that for wives at ages 25-34 and 35-44, increases to 1.7 times at ages 55-59, and drops back to 1.4 times at ages 70-74.

### A Look Back at 1940

In the United States, more people than ever before are married. In 1890, the earliest year Federal census figures are available for marital status (2), 2 out of 3 persons 20 years or older were married. By 1950 this proportion had increased to 3 out of 4. The big jump in the

percentage married came in the last 10 years—from 68.8 percent in 1940 to 74.2 in 1950. For comparison, the percentage distributions by marital status of the male and female populations 20 years and over are given for 1940 and 1950.

	Male		Female	
	1950	1940	1950	1940
Single.....	17.0	23.9	11.8	17.0
Married.....	76.1	69.7	72.3	68.0
Widowed.....	4.7	5.0	13.3	13.2
Divorced.....	2.2	1.4	2.7	1.9

Among both men and women, with few exceptions, in each 5-year age group from 20 to 84 years, the percent single and percent widowed decreased, and the percent married and the percent divorced increased between 1940 and 1950.

The mortality by marital status for the United States in 1940 based on the 1940 census has been published (1). In the 10 years since 1940 there has been a marked decrease in death rate for both men and women at every age. The number of deaths expected in the standard population aged 20 and over—computed in the same manner as described on page 248—decreased a seventh for men and a fourth for women. The percent changes in expected

**Table 2. Death rates by marital status, age, and sex; United States, 3-year average, 1949-51**

(Exclusive of deaths among armed forces overseas. Rates per 1,000 population in each specified group enumerated as of April 1, 1950.)

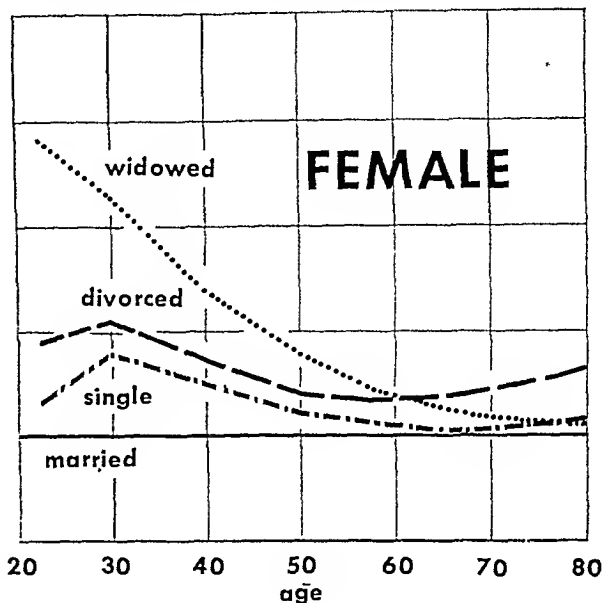
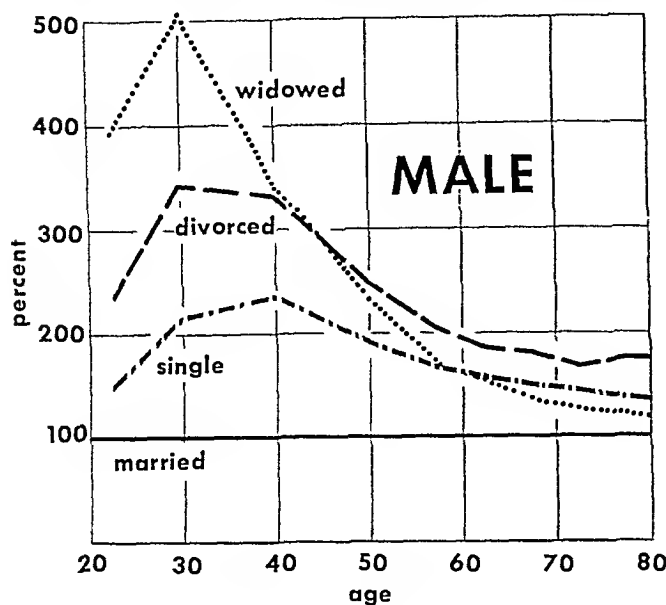
Age (in years)	Male					Female				
	Total <sup>1</sup>	Single	Married	Widowed	Divorced	Total <sup>1</sup>	Single	Married	Widowed	Divorced
All ages <sup>2</sup> .....	11.1	5.4	12.1	70.5	26.1	8.3	3.9	5.8	41.1	8.8
Under 20 <sup>3</sup> .....	3.4	3.4	1.6	2.0	2.3	2.5	2.6	1.0	4.8	1.6
20-24.....	1.9	2.2	1.5	5.7	3.4	1.0	1.2	.9	3.4	1.7
25-34.....	2.2	3.6	1.7	8.6	5.8	1.4	2.2	1.2	4.1	2.6
35-44.....	4.3	8.5	3.6	12.1	11.8	2.9	3.9	2.6	6.2	4.5
45-54.....	10.7	17.8	9.3	21.6	23.2	6.5	7.0	5.7	10.3	8.1
55-59.....	20.0	30.0	17.8	30.4	36.5	11.4	11.5	10.2	14.8	13.8
60-64.....	29.0	41.0	25.8	39.5	48.6	17.5	16.6	15.7	20.7	21.1
65-69.....	41.1	55.0	36.5	50.0	66.1	26.0	24.8	23.5	28.1	33.1
70-74.....	60.4	78.8	54.3	69.1	91.9	43.2	42.3	39.0	44.8	58.2
75 and over.....	119.4	137.3	100.3	139.0	173.3	101.6	103.6	76.0	106.2	129.2

<sup>1</sup> Includes deaths for which marital status was not stated.

<sup>2</sup> Includes deaths for which age was not stated.

<sup>3</sup> Rates for "Total" and "Single" are based on deaths and population at ages 0-19 years. Rates for "Married," "Widowed," and "Divorced" are based on deaths and population at ages 15-19 years.

Age-specific death rates for each marital-sex class as percentages of death rates for married persons of corresponding age and sex; United States, 3-year average, 1949-51.



deaths from 1940 to 1949-51 by marital status were:

	Male	Female
Total.....	-14	-24
Single.....	1	-21
Married.....	-13	-25
Widowed.....	-16	-23
Divorced.....	-16	-33

All but one of the marital-sex classes benefited from the improvement in mortality conditions. Expected deaths for bachelors were about the same in 1949-51 as 10 years ago.

Comparison of the age-specific death rates for 1940 with those for 1949-51 by marital status and sex shows that, except for bachelors, declines were recorded for each marital-sex class at all ages. The percentage changes in death rates between 1940 and 1949-51 are shown in table 3.

Between the two periods, the death rate for women dropped about one-fifth or more for each age group in each marital class, with the greatest drops recorded for the youngest years. At ages 20-34 the rates for wives were cut in half. The death rates for the married, widowed, and divorced men were lower at every age in 1949-51 than in 1940, with the greatest decreases, about a third, recorded for ages under 35. Middle-aged and elderly bachelors did not share in the general mortality improvement of the 10-year period.

The changes in mortality among the marital classes since 1940 can also be seen by comparing the summary measures for 1940 with those for 1949-51 previously described. The 1940 percentages relating the expected number of deaths of each marital-sex class to the expected num-

Table 3. Percentage changes in death rates between 1940 and 1949-51, by marital status, age, and sex: United States

Sex and age (in years)	Single	Married	Widowed	Divorced
<i>Male</i>				
20-24.....	-24	-32	-52	-38
25-34.....	-23	-35	-25	-31
35-44.....	-8	-25	-14	-17
45-54.....	2	-12	-9	-12
55-59.....	5	-7	-13	-7
60-64.....	7	-7	-8	-8
65-69.....	5	-7	-13	-10
70-74.....	5	-10	-13	-20
75 and over.....	4	-12	-14	-19
<i>Female</i>				
20-24.....	-40	-57	-47	-53
25-34.....	-29	-52	-39	-35
35-44.....	-19	-37	-22	-29
45-54.....	-20	-27	-18	-30
55-59.....	-23	-24	-20	-28
60-64.....	-24	-21	-19	-29
65-69.....	-24	-23	-22	-31
70-74.....	-19	-21	-21	-34
75 and over.....	-18	-18	-17	-35



ber of deaths of married persons of the same sex are:

	<i>Single</i>	<i>Married</i>	<i>Widowed</i>	<i>Divorced</i>
Male_-----	141	100	192	215
Female-----	117	100	151	173

The relative mortality of the marital classes did not change in the decade following 1940—the lowest mortality was for the married population, the next for the single group, and the highest among the widowed and divorced—but the percentage excesses in the mortality of the unmarried compared with the married shifted somewhat. The excess in the mortality of bachelors over that of husbands is 41 percent for 1940 and 63 percent for 1949–51. The excess in the mortality of spinsters over that of wives is 17 percent for 1940 and 24 percent for 1949–51. The corresponding excesses in mortality of divorced persons and of widowers are smaller in 1949–51 than in 1940; the excesses in mortality of widows are about the same in the two periods. Such changes have probably resulted from changing factors influencing marital status as well as mortality.

## Summary

Among both men and women at every age, the married have lower death rates than the single, widowed, or divorced. When allowance is made for the variation in age distribution, the mortality of bachelors is nearly two-thirds greater than that of husbands, and the mortality of widowed and divorced men is about double that of husbands. The differences are not as large for women. The mortality of spinsters is a fourth again as high as that of wives, while the mortality of widows and divorcees is half again as high. The available data do not afford an interpretation of the nature of selection of persons into the marital groups, and the effect of marriage itself on mortality rates.

## REFERENCES

- (1) U. S. Bureau of the Census: Mortality by marital status by age, race, and sex, urban and rural, United States, 1940, Vital Statistics—Special Reports, vol. 23, No. 2, 1945.
- (2) U. S. Bureau of the Census: U. S. Census of Population, 1950, vol. 2. Characteristics of the Population. Part 1. United States Summary. Washington, D. C., U. S. Government Printing Office, 1953.

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## Home Safety Booklet Available

An 8-page booklet, entitled "Home Safety Principles," has been prepared from copy published by the National Association of Home Builders in cooperation with the National Safety Council and the Public Health Service in the magazine, *Practical Builder*.

The principles enumerated in this booklet cover general construction and safety inside and outside the house. Specific attention is given to safety matters in the yard, the exterior of the house and garage, roof and chimney, crawl space, kitchen, living, dining and bedrooms, bathroom, closets and storage space, electrical, plumbing, heating, and air conditioning systems. The booklet also features a home safety check list.

Most of the principles can be applied with little or no additional cost. If followed, they should contribute significantly to the reduction of accidental home injuries and deaths.

Copies of the reprint are available from the Division of Engineering Services, Bureau of State Services, Public Health Service, Washington 25, D. C.

# A New Organism Resembling *P. tularensis* Isolated From Water

By CARL L. LARSON, M.D., WILLIAM WICHT,  
and WILLIAM L. JELLISON, Ph.D.

THE DEMONSTRATION of the presence of *Pasteurella tularensis* in ponds, rivers, and streams in northwestern United States (1) prompted continued study on the distribution of *P. tularensis* in such waters, especially where there have been reports of epizootics in aquatic mammals.

During the course of the studies, an organism, apparently not described in the literature, was detected in a water sample obtained from Utah. The purpose of this paper is to describe this organism, for which we propose the name *Pasteurella novicida* sp. nov. In correspondence and in the exchange of cultures, this organism has been referred to as Utah 112.

## Isolation of the Organism

A turbid water sample collected from Ogden Bay Bird Refuge, near Ogden, Utah, was received September 12, 1950, from Dr. Jessup B. Low of the Utah Cooperative Wildlife Research Unit. Muskrats had been found dead in the immediate area where the sample was collected. Two guinea pigs were each injected

intraperitoneally with 10 ml. of this sample, 4 white mice with 2 ml. each intraperitoneally, and 4 white mice with 2 ml. each subcutaneously.

One guinea pig was found dead 6 days after inoculation. Indistinct foci on the liver and spleen were suggestive of tularemia. The other guinea pig, moribund later in the day, was sacrificed and its heart blood placed on glucose-cystine-blood agar. On necropsy, numerous foci of necrosis were observed on the liver and spleen. These lesions were also suggestive of tularemia, and a tentative diagnosis of that disease was made. Cultures from this guinea pig gave pure cultures of the organism under consideration.

One of the mice died on the fourth day post-inoculation and two more on the sixth day. White foci were noted on the spleen of one mouse, and cultures were obtained from the tissues of both mice that died 6 days after injection. The cultures were similar to those isolated from the guinea pig.

Suspensions of the bacterium failed on repeated tests to agglutinate in specific anti-tularensis serum, and tissues of animals which died following injection with the original water sample, as well as tissues from serially infected animals, gave negative Ascoli tests (2) with the same serum.

The failure of the serologic tests to identify the organism as *P. tularensis* was puzzling since the time of death of test animals and the gross

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*Dr. Larson is the director, Mr. Wicht is a laboratory technician, and Dr. Jellison is the parasitologist, Rocky Mountain Laboratory, National Microbiological Institute, Public Health Service.*

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lesions were suggestive of tularemia; also, the growth of the organism on glucose-cystine-blood agar and the appearance of the organism from culture and tissue smears, when stained with carbolthionin, greatly resembled *P. tularensis*.

## Materials and Methods

The methods used in identification of this organism are largely those recommended in the Manual of Methods for Pure Culture Study of Bacteria (3). However, some variations have been necessary, since the organism does not grow on certain of the media which are ordinarily employed for biochemical tests. Routinely, glucose-cystine-blood agar was used for maintenance of the organism. The proteose-peptone broth of Snyder and his co-workers (4) was employed as the liquid medium. For fermentation tests, filter-sterilized carbohydrates and polyhydroxyalcohols were added in 2-percent concentration, and bromthymol blue was added as indicator. Experimental animals were from stock maintained at the Rocky Mountain Laboratory. Embryonated eggs were inoculated after incubation at 37° C. for 7 days.

Ascoli tests were performed, using bacterial or tissue suspensions treated with ether, according to methods previously described (2).

Organisms used in this study included the bacterium isolated from water from Ogden Bay, *P. tularensis* (strains 453 and 454, which were isolated from streams in the Bitterroot Valley, Mont.), as well as *Pasteurella pestis*, *Pasteurella multocida*, and *Pasteurella pseudotuberculosis*, which are maintained at this laboratory.

## Results

The newly isolated bacteria under study are nonmotile, gram-negative rods, which do not form spores. There is some tendency toward bipolar staining, but this is not marked and does not serve as a distinguishing feature. No flagellae are observed. No definite capsule is apparent in preparations from artificial media stained with carbolthionin, Giemsa, or Wayson's stains, although clear areas are observed around cells in smears from tissues of infected animals. In smears prepared from spleens of guinea pigs

and stained with carbolthionin, the organisms are ovoid to coccoid, measure 0.28 $\mu$  in length and 0.20 to 0.28 $\mu$  in width, and are arranged singly and in small clusters. When grown in liquid media they are 0.7 $\mu$  in width and 1.7 $\mu$  in length, and are predominantly short, thick rods with slightly bulging sides. They are arranged singly or in pairs. A few coccoid forms are present. If the bacteria are grown in broth containing 3 percent NaCl, the organisms are found to be pleomorphic, and rods as long as 4.2 $\mu$  are noted. When grown on solid media, the organisms measure 0.47 $\mu$  to 0.94 $\mu$  in length and 0.47 $\mu$  in width. These examinations were made by phase microscopy with organisms grown at 37° C. for 24 or 48 hours. Broth cultures were examined for motility after incubation for 18, 24, and 48 hours at 25° C. and 37° C., by both light- and dark-field microscopy.

On primary isolation, the culture grows well on glucose-cystine-blood agar, but not on nutrient agar (Difco). Cultures made directly from animal tissues by smearing liver or spleen upon the surface of horsemeat-infusion agar do not grow except in the immediate vicinity of small pieces of tissue that adhere to the medium. After 11 serial passages in guinea pigs, *P. novicida* still could not be isolated on media lacking added cystine, yeast extract, or whole blood. Plating of serial dilutions on the surface of various media indicates that glucose-cystine-blood agar, glucose-cystine agar, blood agar, or yeast-extract agar are about equally suitable media. No growth occurred in plain horsemeat-infusion agar, with or without addition of dextrose, even when as many as 50,000 organisms were present in the inoculum.

On glucose-cystine-blood agar, well-separated colonies may attain 8 mm. in diameter after 72 hours' incubation. They are gray with a definite blue cast, smooth, slightly elevated, glistening, amorphous, and have entire edges. The colonies are butyrous or viscid and are easily emulsified in water to form a homogeneous suspension. Colonies average about 4 mm. in diameter on blood agar but otherwise resemble those described above. On glucose-cystine agar, they average 6 to 7 mm. in diameter and are translucent. On yeast-extract agar, the colonies are about 3 mm. in diameter, clear, convex, glistening, and with smooth edges. Growth

is moderate in 24 hours at 37° C. on slanted media, and isolated colonies have characteristics similar to those described for each of the above media. The growth is filiform and tends to pile up at the edges. There is no hemolysis on blood agar.

In deep agar shakes of media containing yeast extract or cystine incubated for 8 days at room temperature at 30° C. and 37° C., the organisms grow on the surface and to a depth not exceeding 0.7 cm. below the surface. The surface colonies approximate 5 mm. in diameter whereas those growing within the agar are 1 mm. or less.

In the fluid medium employed (4), growth is abundant, producing a moderately uniform turbidity. There is no pellicle or surface growth. A slight deposit develops, which may be disintegrated by shaking. No growth can be seen on raw potato.

### Fermentation

The first isolate of *P. novicida* was found to ferment dextrose, sucrose, levulose, and mannose, with production of acid but no gas. A culture isolated from the 11th passage in guinea pigs was tested in Snyder's medium containing 2-percent concentrations of the various substrates and bromthymol blue to determine the fermentative reactions of the organism. The medium was dispensed in 25-ml. volumes in 100-ml. flasks and incubated at 37° C.

Two cultures of *P. tularensis* (isolates 453 and 454) were studied under identical circumstances. Each flask of medium was inoculated with 1 ml. of suspension of organisms grown in Snyder's medium for 24 hours at 37° C. Flasks of Snyder's medium were included as uninoculated controls and flasks containing indicator but no added substrate served as inoculated controls. The color changes were noted and the pH determined, with the aid of a pH meter, 4 and 14 days after incubation. The results of pH determinations are presented in table 1.

Additional carbohydrates and polyhydroxy-alcohols not included in the table were tested. These were inulin, rhamnose, trehalose, sorbitol, arabinose, adonitol, dextrin, melizitose, salicin, inositol, xylose, lactose, esculin, raffinose, galactose, mannitol, and dulcitol. The final pH attained by media containing these substances was 7.3 to 7.6 for *P. tularensis* isolate 453, 7.4 to 7.8

Table 1. Comparative fermentation studies on *Pasteurella tularensis* and *Pasteurella novicida*

Substrate	pH reactions of media after 4 and 14 days' incubation with—					
	<i>P. tularensis</i> (453)		<i>P. tularensis</i> (454)		<i>P. novicida</i>	
	4 days	14 days	4 days	14 days	4 days	14 days
Sucrose---	7.6	7.5	7.6	7.6	5.6	5.5
Dextrose---	6.9	6.5	6.9	6.8	5.7	5.6
Levulose---	6.6	5.8	6.5	6.2	5.7	5.2
Mannose---	6.9	6.7	6.9	6.6	5.8	5.5
Glycerol---	7.6	7.6	7.5	7.6	7.3	6.9
Maltose---	7.6	7.5	7.6	7.6	7.7	7.6
Inoculated control---	7.5	7.5	7.5	7.6	7.7	7.7

for *P. tularensis* isolate 454, and 7.4 to 7.7 for *P. novicida*. Fermentation of sucrose by *P. novicida* serves to differentiate it from *P. tularensis*.

The effect of fermentable sugars upon the growth of the organism was determined. Cultures were made in Snyder's medium containing dextrose, sucrose, maltose, and lactose, all with bromthymol blue as indicator. After 3 days' incubation at 37° C., when the color of the medium indicated that fermentation of dextrose and sucrose had taken place, serial tenfold dilutions were made of the bacterial suspensions, and counts were made on glucose-cystine-blood agar. The bacterial counts of each of the media were in very close agreement, being  $25 \times 10^8$  and  $27 \times 10^8$  for media containing dextrose and sucrose, respectively, and  $24 \times 10^8$  and  $19 \times 10^8$  for those with maltose and lactose, respectively. Thus, the presence of fermentable sugars had no effect on the growth of *P. novicida*.

### Biochemical Reactions

The following biochemical reactions were observed: nitrates not reduced to nitrites; indol negative by Kovac's method;  $H_2S$  positive by lead acetate paper strips; ammonia not produced; methylene blue reduced, catalase positive; gelatin contained no added cystine supported growth but was not liquefied; litmus milk unchanged; methyl red and Voges-Proskauer negative, although growth was manifest

in the medium; no growth on McConkey's medium.

The resistance of the organism, comparable to that of *P. tularensis*, is not great. Suspensions containing  $4 \times 10^8$  bacteria in saline were killed in 10 minutes by exposure to a temperature of 60° C. and in 20 minutes by exposure to 1 per cent phenol. Cultures of *P. novicida* and *P. tularensis* (453 and 454) were grown on glucose-cystine-blood agar at temperatures of 25°, 32°, 37°, and 41° C. Three subcultures were made during an observation period of 16 days. None of the strains of organisms was affected by exposure to the limits of temperature selected since there was confluent growth on each of the agar slants at the termination of the experiment.

No evidence for the presence of a soluble toxin or for the filterability of the organism was found. A culture of the organism was grown in Snyder's medium at 37° C. for 48 hours and filtered through a sintered glass filter (grade UF). The first aliquot of 10 ml. was discarded. The remainder of the filtrate was collected and tested for sterility. No growth occurred on glucose-cystine-blood agar plates or on Snyder's medium. Mice and guinea pigs inoculated intraperitoneally with 0.1 and 5.0 ml., respectively, of this filtrate were not infected.

#### Pathogenicity

*P. novicida* is pathogenic for a wide range of experimental animals. The pathogenicity for white mice and guinea pigs is shown in table 2. As few as 50 organisms injected subcutaneously into mice caused death, whereas as few as 5 organisms administered intraperitoneally caused death in 3 of 4 mice. Small numbers of organisms were also shown to be lethal for guinea pigs by intraperitoneal injection. Hamsters were as susceptible as mice and guinea pigs and showed more distinctive gross lesions. Titrations of cultures and tissues from infected animals or embryonated eggs demonstrated that suspensions containing two bacteria, as determined by growth on glucose-cystine-blood agar plates, were capable of producing lethal infections in 7-day-old embryonated eggs. The disease produced in embryos was fatal within 2 to 7 days.

There was considerable resistance to infection in rabbits, white rats, and pigeons, and

**Table 2. Mortality among groups of white mice and guinea pigs inoculated with a suspension of spleen from a guinea pig dying during the 10th serial passage of *Pasteurella novicida* in guinea pigs**

Animal and route of inoculation <sup>1</sup>	Dilution of spleen suspension <sup>2</sup>	Amount injected (ml.)	Approximate number of organisms	Results <sup>3</sup>
<i>White mouse</i>				
IP	10 <sup>-1</sup>	0.2	5,000	4/4
IP	10 <sup>-2</sup>	.2	500	4/4
IP	10 <sup>-3</sup>	.2	50	4/4
IP	10 <sup>-4</sup>	.2	5	3/4
SQ	10 <sup>-1</sup>	.2	5,000	4/4
SQ	10 <sup>-2</sup>	.2	500	3/4
SQ	10 <sup>-3</sup>	.2	50	4/4
SQ	10 <sup>-4</sup>	.2	5	0/4
IM	10 <sup>-1</sup>	.1	2,500	4/5
IC	10 <sup>-1</sup>	.03	Ca 800	5/5
<i>Guinea pig</i>				
IP	10 <sup>-1</sup>	0.2	5,000	4/4
IP	10 <sup>-2</sup>	.2	500	4/4
IP	10 <sup>-3</sup>	.2	50	4/4
IP	10 <sup>-4</sup>	.2	5	0/4
SQ	10 <sup>-1</sup>	.2	5,000	4/4
SQ	10 <sup>-2</sup>	.2	500	4/4
SQ	10 <sup>-3</sup>	.2	50	4/4
SQ	10 <sup>-4</sup>	.2	5	2/4

<sup>1</sup> IP, intraperitoneal; SQ, subcutaneous; IM, intramuscular; IC, intracerebral.

<sup>2</sup> No deaths among animals inoculated with 10<sup>-5</sup>, 10<sup>-6</sup>, or 10<sup>-7</sup> dilutions.

<sup>3</sup> Numerator, number died; denominator, number inoculated.

large numbers of organisms were needed to produce signs of illness and death. Six million organisms caused death within 4 days of three pigeons inoculated intramuscularly, but  $6 \times 10^5$  organisms failed to produce illness in a similar group of birds. Rabbits infected with as few as  $3 \times 10^4$  organisms succumbed if inoculated either intraperitoneally or subcutaneously, but some lived as long as 25 days. White rats were susceptible to large doses of organisms administered intraperitoneally ( $3 \times 10^7$ ) but not to similar amounts given subcutaneously.

There were no pathognomonic lesions in embryonated eggs examined after death of the embryo, but hemorrhages and congestion were commonly noted. Mice inoculated subcutaneously showed congestion of the subcutaneous tissues, hemorrhages at the site of inoculation, with enlargement and congestion of the local lymph nodes, hemorrhages and congestion of

the lungs, and enlargement of the spleen, with multiple small foci of necrosis. There were no gross lesions in the liver. The subcutaneous tissue of guinea pigs was hemorrhagic and congested, the local lymph nodes were enlarged and hemorrhagic, the spleen was enlarged, containing many small, raised gray foci of necrosis and was usually covered with a gray exudate. The liver contained few to many foci of necrosis. The lungs were congested and hemorrhagic and exhibited foci of necrosis in many instances. The lesions noted in rabbits, white rats, and hamsters were essentially similar to those noted in white mice and guinea pigs. In one rabbit, surviving for 25 days after infection, many large caseous areas of necrosis were found in the lungs.

### Serologic Reactions

Agglutination and precipitin tests were performed with serums from rabbits immunized by repeated intravenous inoculation of formalin-killed suspensions of *P. tularensis*, *P. novicida*, *P. pestis*, *P. pseudotuberculosis*, and *P. multocida*. A formalin-killed suspension of each of the organisms was employed for agglutination tests. Precipitin tests were done with the supernatant fluid obtained after suspensions of the organisms in saline had been treated with two volumes of ether, and the aqueous phase centrifuged and harvested (2). The tests were incubated at 37° C. for 4 hours and placed in the refrigerator overnight before being read the following morning.

It was found that formalin-killed suspensions of *P. novicida* reacted in the agglutination test with serum prepared against the homologous organism but not with serums prepared against the heterologous organisms. Similarly, the immune serum prepared against *P. novicida* agglutinated suspensions of *P. novicida* to a titer of 1:320, *P. tularensis* and *P. pseudotuberculosis* to titers of 1:10 only and failed to react with *P. pestis* and *P. multocida*.

The several serums were tested for the presence of precipitins against *P. novicida*. The *P. novicida* antigen employed failed to react with serums from rabbits immunized with *P. pseudotuberculosis* and *P. multocida*, but reacted with undiluted serums specific for *P.*

*pestis* and *P. tularensis* and to a titer of 1:32 against homologous serum. The anti-novicida serum precipitated with antigens derived from *P. pestis* and *P. tularensis* in dilution of 1:4, from *P. pseudotuberculosis* to a dilution of 1:2, from *P. novicida* to a titer of 1:32, and failed to precipitate antigen from *P. multocida*. When dilutions of antigen prepared from *P. novicida* were tested against whole serums in the precipitin test, the antigen did not react with serums specific for *P. multocida* and *P. pseudotuberculosis* but reacted at dilutions of 1:4 with serums against *P. pestis* and *P. tularensis* and at a dilution of 1:64 against the homologous serum. In general, the serums from rabbits immunized against formalin-killed antigens gave specific reactions in both agglutination and precipitin tests.

Precipitin tests were performed with serums from rabbits immunized with suspensions of *P. novicida* and *P. tularensis* killed: (a) by heating at 60° C. for 30 minutes, (b) by addition of 2 volumes of ether, and (c) by 0.2 percent formalin or 0.5 percent phenol. Antigens were obtained by extraction with ether. The results given in table 3 indicate that the antibodies produced are relatively specific for each bacterial species and do not appear to be significantly varied by the type of treatment afforded the antigen employed to immunize the animals.

Table 3. Results of precipitin tests with serums of rabbits sensitized with variously treated antigens

Type and serum No.	Method of killing	Titer of reaction with antigen from—	
		<i>P. novicida</i>	<i>P. tularensis</i>
<i>P. novicida</i>			
9650-----	Ether-----	1:32	1:4
9651-----	do-----	1:32	1:1
9652-----	Heat-----	1:128	1:4
9654-----	Formalin-----	1:64	1:2
9655-----	do-----	1:128	1:2
9657-----	Phenol-----	1:128	1:2
<i>P. tularensis</i>			
9658-----	Ether-----	1:8	1:128
9662-----	Formalin-----	1:4	1:128
9665-----	Phenol-----	1:2	1:64

## Discussion

The organism described has certain characteristics that indicate a relation to the organisms contained in the family Parvobacteriaceae, but it cannot be associated directly with any of the various tribes within the family. Morphologically, it has considerable resemblance to *P. tularensis*, being similar in microscopic appearance, in showing considerable dependence upon growth factors in blood, yeast extract, or cystine, and in characteristic colonial growth on glucose-cystine-blood agar. The lesions produced in experimental animals and the wide range of hosts susceptible to infection increase the apparent resemblance. Both may be found in natural waters of the western States. They differ markedly, however, in immunological characteristics and may be distinguished by either agglutination or precipitin tests. In addition, *P. novicida* ferments sucrose, whereas *P. tularensis* does not.

There has been considerable discussion as to whether or not the etiological agent of tularemia is justifiably included in the genus *Pasteurella*. At present, it would appear best to leave it in the genus *Bacterium* until its taxonomic position is clarified. We would prefer to place the newly isolated organism in the genus *Bacterium* for the same reason. However, the genus name *Bacterium* is a "rejected generic name" by recent (1954) action of the International Committee on Bacteriological Nomenclature (5) so it is not available. The only alternative to the use of *Pasteurella* would be to establish a new genus name for the two organisms. This we are not prepared to do at this time.

Further examination of natural waters in the western United States, including Ogden Bay, has not resulted in additional isolations of *P.*

*novicida*. Many cultural studies of the laboratory animals maintained at the Rocky Mountain Laboratory have not revealed the organism to be present in the animal colonies, justifying the conclusion that the isolation of *P. novicida* from guinea pigs and mice inoculated with water represented a valid isolation from the water sample involved.

## Summary

A micro-organism highly pathogenic for mice, hamsters, guinea pigs, and rabbits has been isolated from a water sample collected in Ogden Bay, Utah. In gross appearance of cultures, microscopic appearance, and pathogenicity, it closely resembles *Pasteurella tularensis*. It may be distinguished, however, from *P. tularensis* by fermentation studies and by serologic tests. The organism is described and the name *Pasteurella novicida* sp. nov. is proposed.

## REFERENCES

- (1) Parker, R. R., Steinhilber, E. A., Kohls, G. M., and Jellison, W. L.: Contamination of natural waters and mud with *Pasteurella tularensis* and tularemia in beavers and muskrats in the northwestern States. National Institutes of Health Bull. No. 193, 1951, pp. 1-61.
- (2) Larson, C. L.: Studies on thermostable antigens extracted from *Bacterium tularense* and from tissues of animals dead of tularemia. J. Immunol. 66: 249-259 (1951).
- (3) Manual of methods for pure culture study of bacteria. Geneva, N. Y., Biotech Publications, 1948-54, leaflets 1-10.
- (4) Snyder, T. L., Penfield, R. A., Engley, F. B., Jr., and Creasy, J. C.: Cultivation of *Bacterium tularense* in peptone media. Proc. Soc. Exper. Biol. & Med. 63: 26-30 (1946).
- (5) Rejection of the generic name *Bacterium*. Internat. Bull. Bacteriol. Nomenclature and Taxonomy 4: 141-142 (1954).

PHR



# Rheumatic Fever Management

*Notes on a panel discussion at the Second World Congress of Cardiology, Washington, D. C., September 14, 1954. Chairman, T. Duckett Jones, M.D., medical director of the Helen Hay Whitney Foundation, New York City (died November 22, 1954). Co-chairman, Maurice Campbell, M.D., London, England. Panel members: Edward F. Bland, M.D., Massachusetts General Hospital, Boston. Albert Dorfman, M.D., Chicago. John D. Keith, M.D., Toronto, Canada. Charles H. Rammelkamp, M.D., Cleveland, Ohio.*

. . .

IS RHEUMATIC FEVER declining in prevalence and incidence? Clinical evidence, such as the relatively rare occurrence of severe chorea, or St. Vitus' dance, suggests a decline in severity. Statistical evidence, such as the decline in cases in all age groups reported in Toronto by Dr. John D. Keith, suggests a decline in prevalence. The accompanying chart, prepared by the National Heart Institute of the Public Health Service, also suggests a decline in the number of cases and severity of rheumatic heart disease. Nevertheless, Dr. T. Duckett Jones observed that the apparent decline may result from improved environmental conditions, such as heating and nutrition, rather than from any genuine change in the organic process. He stated there has been no change in the ability to contract rheumatic fever. And he felt the decline in cases may be more apparent than real. As he put it, when successful heart surgery was announced, rheumatic cardiac cases more often sought relief and advice. He believed that a decrease in crowding in the home has reduced exposure to streptococcal infections. It was noted also that the use of antibiotics has greatly lessened the incidence and possibly the duration of recurrences.

## Diagnosis

With regard to methods of diagnosing rheumatic fever, the panel agreed that no specific laboratory test is entirely satisfactory. It concluded that, although sedimentation rate tests were very helpful, accurate diagnosis still depends primarily upon direct evidence of the patient's condition and history. However, it was noted that many patients with serious rheumatic heart disease give no history of the swelling, redness, and pain of the joints which are often typical clinical symptoms. For this reason, considerable interest was expressed in the work of Dr. May Wilson, who has undertaken to determine whether fluoroscopic observation of progressive enlargement of the heart chambers may be a practical diagnostic aid. The panel seemed to agree that a thin, pinched, weary appearance in the child is a distinct clue to rheumatic fever activity.

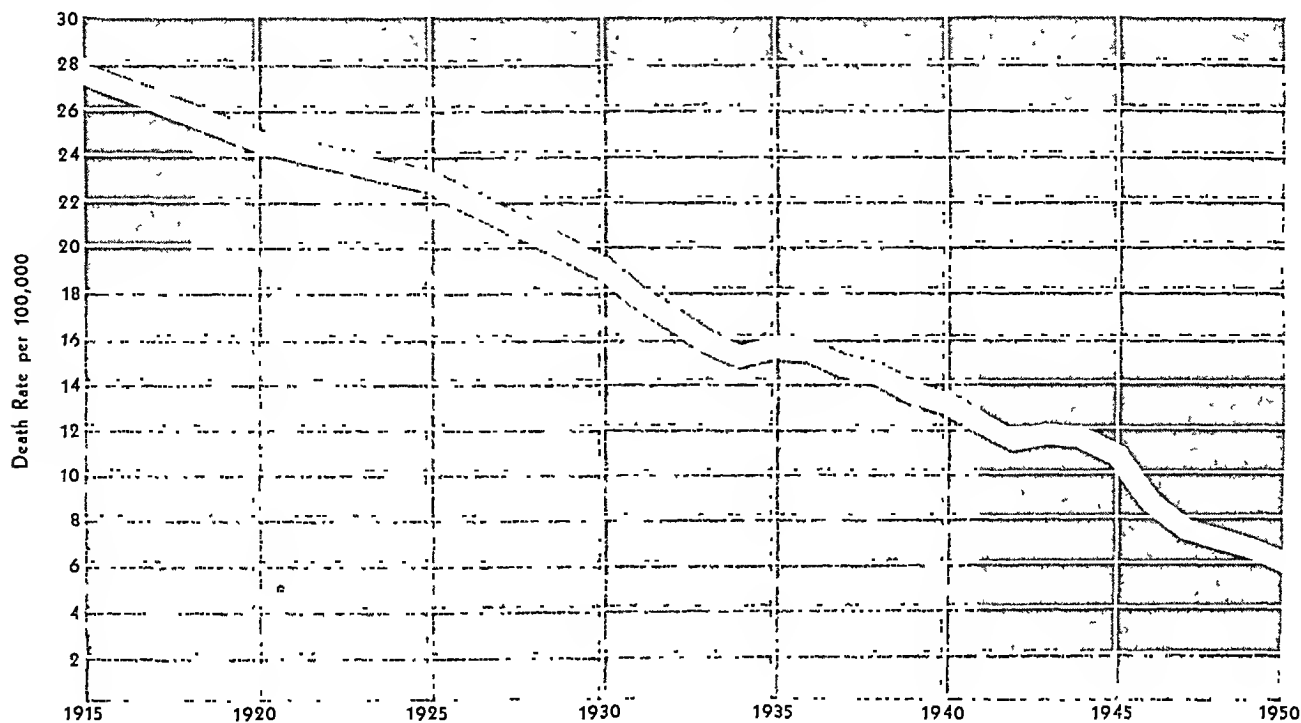
Dr. Edward F. Bland reported that of 1,000 rheumatic fever patients observed since childhood in the past 20 years somewhat fewer than a third had died. Of these, 80 percent had died of congestive heart failure. Ten percent had died of acute or subacute bacterial endocarditis. The remainder had died of other causes, about half of which were not related to the chronic affliction. He observed also that the surviving patients had been treated successively by salicylates, sulfadiazine, and penicillin, and that many now might have their health and expectancy protected by valve surgery.

## Control

Dr. Charles H. Rammelkamp asserted that when sulfadiazine or penicillin failed to prevent rheumatic fever the failure often lay with the patient's refusal to follow prescribed orders rather than with the effects of the compounds.



**Heart disease (mainly rheumatic) and rheumatic fever, age-specific death rates per 100,000 persons aged 5-24, United States, 1915-50.**



He asserted also that, since the average child experiences a streptococcal infection about once every 4 or 5 years, the best method of preventing rheumatic fever, a potential result of any streptococcal infection, is to eradicate the streptococci. Such eradication can be achieved by administering compounds not only to the infected child but also to other exposed members of the family. He noted that sulfadiazine used against the streptococcal infection is ineffective against a rheumatic fever attack. Penicillin is the drug of choice.

Dr. Jones commented that a statement on prophylaxis for rheumatic fever, issued by the American Heart Association, is being revised and that a new statement is forthcoming. It was advised that administration of a depositional form of penicillin about a month prior to a valve operation for rheumatic fever patients might protect against postoperative flareup of the disease.

#### **Fundamental Studies**

Immediately before the panel discussion, Dr. Lewis Thomas of Minneapolis described studies which explored the fibrinoid processes involved in rheumatic fever, lupus erythematosus, and related collagen diseases.

The process which develops from a streptococcal infection and leads to rheumatic fever and cardiac injury was the subject of a paper presented at the congress by Dr. Aaron Kellner and Dr. Theodore Robertson of New York. They observed that a proteolytic enzyme produced by many strains of group A streptococci acts as a powerful poison upon the heart. This enzyme was isolated in crystalline form by Dr. Stuart Elliott of the Rockefeller Institute.

• • •

*NOTE: The American Heart Association's revised statement on rheumatic fever prophylaxis will appear in the April issue of Public Health Reports.*

*Important implications for civil defense lie in this study of 6,343 case histories of radiation injuries, flash burns, lacerations, and contusions—received outdoors or indoors within a 2.3-mile radius of ground center.*

# Atomic Bomb Injuries Among Survivors in Hiroshima

By MARDELLE L. REYNOLDS, A.B., and FRANCIS X. LYNCH

THE PRIMARY PURPOSE of this paper is to present the results of a study of atomic bomb injuries in relation to the type of protection of survivors who were at varying distances from the ground center of the explosion in Hiroshima, Japan, on August 6, 1945. An analysis has been made of the clinical histories of 5,136 injured persons and interviews with 1,207 uninjured persons exposed to the bomb. These histories and records of interviews were collected by physicians of the Joint Army-Navy Commission which investigated the medical effects of the bomb within a few months after the explosion (1).

## Limitations of the Data

It is recognized that no statistical study of the types of injury incurred as a result of the

atomic bombing in Hiroshima can be fully representative of those actually sustained in that city. Authorities agree that no accurate count of the exact number of dead and injured will ever be possible and that causes of death in the areas of greatest destruction can only be estimated. Since the individuals in our study include only those who survived the disaster and were able to escape from the damaged areas of the city alone or with assistance of others, the distribution and severity of injuries in this group may be expected to differ from estimated causes of immediate death.

The total population of Hiroshima at the time the bomb was dropped and the number of injured survivors have been variously estimated. One such estimate (2) places the population figure at 245,000 with equal numbers—70,000 to 80,000 each—injured and killed, or missing and presumed to be dead. If these figures may be regarded as reasonably accurate, our study comprises a maximum 7.3 percent sample of injured survivors and 1.1 percent of the uninjured—a figure of 98,265 exposed individuals residing in Hiroshima in 1950 was obtained from the Atomic Bomb Casualty Commission's survivor questionnaire, circulated with the Japanese national census of October 1, 1950 (3).

Some bias may exist in our sample, because of the fact that many survivors, both injured

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and uninjured, left the city soon after the bombing, and the fact that an unknown number of the injured may have died elsewhere. However, an indication that many of those who fled the city had returned by the time of the interviews is afforded by the fact that the population of Hiroshima had reached 137,000 by November 1, 1945.

A long-range followup of the effects of the detonations on survivors and their descendants may alter some of the data as to actual distance of survivors from the ground center of the explosion. It is possible that the earlier interviewers' estimates of distances at specified locations reported by those interviewed were calculated hurriedly or without the aid of detailed maps which were available to later investigators.

On the other hand, persons interviewed immediately or within a short time after may have given a more nearly accurate description of their positions at the time of the bombing than at subsequent interviews when accounts given by other exposed individuals might have come to be identified as their own experiences. For this reason and also because no similar data based on the interviews by the Joint Army-Navy Commission appear to have been published, it was considered desirable to study the types of injuries in relation to the distances and the type of shelter or lack of shelter afforded the survivors.

A recent semiannual report of the Atomic Bomb Casualty Commission (4) states that "1,009 individuals surviving under 1,000 meters

and 9,191 between 999 and 1,499 meters were located during the Japanese national census in 1950." The Joint Army-Navy Commission sample includes 816 persons who were recorded as being within 1,000 meters from ground center of the explosion, 306 of whom died after admission to hospitals. At the distance of 1,001 through 1,500 meters, the sample shows 1,134 persons, 1,081 of whom were living several weeks to months after the bombing.

### General Characteristics of the Sample

The total case records included in this study number 6,343. These include 5,136 injured persons, 384 of whom died in hospitals where their histories were obtained, and 1,207 who were uninjured. All these persons reported that they were within a radius of 13,120 feet from the ground center of the explosion. Not included in the study are a small number of uninjured persons within this distance who were in tunnels or air raid shelters and 229 who were at distances ranging from 13,121 to 16,400 feet from ground center.

The distance, in feet, of the injured and uninjured persons from the ground center of the explosion is shown in table 1. The percentages of uninjured persons increased with increasing distance from ground center as would be expected. The 5,136 injured persons comprise 81 percent of the total.

Four types of protection, or lack of protection, were coded by the original investigating groups and tabulated in relation to the 6,343 persons

**Table 1. Injured and uninjured persons in Hiroshima sample study in relation to distance from ground center of explosion**

Distance (in feet)	Total	Injured				Uninjured	
		Alive		Dead			
		Number	Percent	Number	Percent	Number	Percent
3,280 or less.....	816	500	61	306	38	10	1
3,281-6,560.....	2,844	2,465	86	74	3	305	11
6,561-9,840.....	2,122	1,564	74	14	(2)	554	26
9,841-13,120.....	561	223	40	-----		338	60
Total.....	6,343	4,752	75	1,384	6	1,207	19

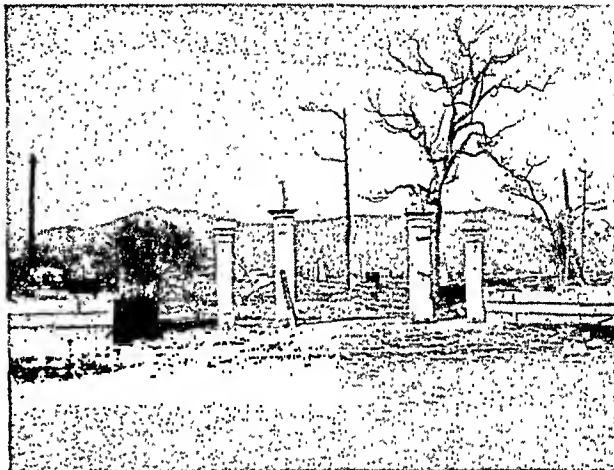
<sup>1</sup> Includes 1 dead, no injury recorded.

<sup>2</sup> Less than 0.5 percent.

# the atomic strike—



*Armed Forces Institute of Pathology photographs*



Government Prefectural Office before and after the explosion occurring August 6, 1945 (2,952 feet).



Communications building (4,592 feet). General view looking away from the center.



An example of destruction of wooden buildings by the A-bomb explosion at a point 13,120 feet from the center of the explosion. Photograph was taken at 8:00 a. m. August 10, 1945.

**Table 4. Location and type of protection and distance from ground center of explosion in relation to incidence of injuries <sup>1</sup>**

Location and protection	Total injured	Percent of injured with—		
		Radiation	Mechanical injury	Burns
	3,280 feet or less			
Outdoors:				
Unshielded.....	128	82	28	76
Shielded.....	62	88	55	43
Indoors:				
Japanese-type building.....	471	92	70	15
Heavy building.....	145	77	80	22
	3,281-6,560 feet			
Outdoors:				
Unshielded.....	922	27	20	91
Shielded.....	290	39	59	47
Indoors:				
Japanese-type building.....	1,139	34	84	19
Heavy building.....	188	24	87	19
	6,561-13,120 feet			
Outdoors:				
Unshielded.....	778	12	19	90
Shielded.....	126	17	59	43
Indoors:				
Japanese-type building.....	863	13	87	14
Heavy building.....	24	17	88	13

<sup>1</sup> Percentages add to more than 100 since many persons had more than 1 type of injury.

*Effects of radiation were encountered in 34 percent of the injured persons.*

As would be expected among individuals who survived for several weeks or months, the radiation was more often described as moderate than as severe. We have previously reported that 18 survivors who were reported as outdoors and unshielded within 3,280 feet of ground center had symptoms indicating only moderate radiation sickness (9).

No blast injuries were noted in the persons seen by the Joint Commission physicians, nor, according to the Tokyo Army Medical College (8), were there many survivors with internal

injuries and blood vessel injuries. The possibility of death from central nervous system injury resulting in pulmonary edema and hemorrhage among persons in close proximity to walls or the ground in cases where the blast would strike the surface square on is suggested by Cas-sen, Kistler, and Mankiewicz (10), on the basis of experimental data.

The breakdown of injuries by location (table 3) shows that mechanical injuries occurred in 82 percent of the injured survivors who were inside buildings as compared to 28 percent of those who were outdoors. In contrast, flash burns were reported for 17 percent of the survivors indoors and 80 percent of those outdoors. Radiation effects were noted chiefly among survivors near the ground center, where gamma rays penetrated buildings and where instantaneous deaths from massive radiation may have occurred among persons unprotected by buildings. This may account for the higher percentage of radiation injury among survivors indoors than among those who were outdoors.

The incidence of injuries among injured survivors at different distances from ground center is considered with respect to type of protection

**Table 5. Types of single and multiple injuries of 5,136 injured persons**

Type of injury	Total	Distance from ground center (feet)		
		3,280 or less	3,281-6,560	6,561-13,120
Total injured.....	5,136	806	2,539	1,791
Percent of total				
Mechanical:				
Alone.....	33	8	33	43
With radiation.....	14	42	13	4
With burns.....	7	2	8	8
With both.....	4	11	4	1
Total.....	58	63	58	56
Burns:				
Alone.....	27	3	27	36
With radiation.....	7	12	9	3
Total.....	34	15	36	39
Radiation alone.....	8	22	6	5

Table 6. Location, type of shelter, and distance from ground center of explosion in relation to type of injury

Location and shelter	Total (100 per- cent)	Percent in group						
		Mechanical injury				Radiation		Burns alone
		Alone	With burns	With radia- tion	With burns and radia- tion	Alone	With burns	
3,280 feet or less								
Outdoors:								
Unshielded.....	128	1	4	9	14	14	45	13
Shielded.....	62	7	-----	29	19	21	19	5
Indoors:								
Japanese-type building.....	471	6	2	53	9	26	4	(1)
Heavy building .....	145	19	3	43	15	16	3	1
3,281-6,560 feet								
Outdoors:								
Unshielded.....	922	5	9	2	4	2	19	59
Shielded.....	290	29	9	15	6	9	9	23
Indoors:								
Japanese-type building.....	1, 139	53	7	21	3	7	3	5
Heavy building.....	188	61	9	14	3	6	1	6
6,561-13,120 feet								
Outdoors:								
Unshielded.....	778	7	9	1	2	3	6	72
Shielded.....	126	41	10	8	-----	8	1	32
Indoors:								
Japanese-type building.....	863	75	6	6	1	5	1	6
Heavy building.....	24	71	8	8	-----	8	-----	5

<sup>1</sup> Less than 0.5 percent.

or lack of protection in table 4 and for the percentages outdoors and indoors in figure 1. Radiation injury was found generally unrelated to type of protection, and there was rapid fall-off from the first distance zone outward.

Mechanical injuries were definitely related to the amount of protection afforded. Whereas no more than 28 percent of the survivors who were outdoors and unshielded in any distance zone had such injuries, the percentages with mechanical injuries who were indoors in heavy buildings ranged from 80 to 88 percent. Of interest also are the statistically significant higher percentages of mechanical injuries among persons injured outdoors in each zone who were presumably "shielded" than among those outdoors and unshielded.

The highest incidence of burns occurred in the second distance zone and beyond. Forty-

eight percent of all the injured survivors at 3,281-6,560 feet and from this zone outward had burns, as compared with 28 percent of those nearest ground center. (Burns occurred in only 17 percent of the victims at the 9,841 to 13,120 feet distance.) However, 76 to 91 percent of the injured survivors outdoors and unshielded in each distance zone incurred flash burns. Any form of protection decreased the percentages with burns.

A breakdown of the injuries into single and multiple types revealed that while two-thirds of the injured survivors had only 1 form of injury, this was not true of those within 3,280 feet of ground center, where 67 percent had multiple injuries. The types of injuries, alone and in combination, are presented in table 5. Here, by addition of the percentages, it is evident that 87 percent who were within the first

3,280 feet had radiation, but it was the sole injury for only 22 percent. The most frequent combination at this distance was radiation with mechanical injury,—in 42 percent. Many such patients who received therapy were treated for their mechanical injuries only, since the effects of radiation were not immediately manifest. The influence of various kinds of protection or the lack of protection upon the types of injuries sustained is demonstrated in table 6.

Physicians of the Joint Army-Navy Commission assigned ratings of "severe" or "moderate" to the types of injuries described by the survivors whom they actually interviewed. Similar ratings were not made for the seriously injured persons who died in hospitals. The relative severity of the nonfatal injuries within the first 3,280 feet from ground center, which is of particular interest, is shown in table 7. Symptoms indicating severe radiation occurred in 57 percent of the 510 survivors not fatally injured in this zone, and in 66 percent of those who were outdoors and presumably shielded by walls or other objects. Severe radiation among such survivors in Japanese-type buildings was approximately the same as for those outdoors

and shielded, 64 and 66 percent, respectively. Thirty-eight percent of those in heavy buildings also had severe radiation injury.

Mechanical injuries which were considered severe occurred with approximately equal relative frequency in Japanese-type and in heavy buildings in this first zone.

Mechanical injuries were considered as the most severe type of injury sustained by 1 of the 2,826 persons who had this type of injury. As shown in table 8, the severe mechanical injuries in each distance zone increased with increasing protection and were incurred in approximately one-half to two-thirds of the injured persons who were indoors in buildings, either light or heavy construction.

### Summary

Data pertaining to 6,343 survivors (5,136 injured and 1,207 uninjured) of the atomic explosion in Hiroshima on August 6, 1945, analyzed with respect to the incidence of mechanical and radiation injuries and flash burns in relation to distance from ground center and type of protection. The data were based

**Table 7. Percent of injured persons with moderate or severe nonfatal<sup>1</sup> injuries, 3,280 feet or from ground center of explosion, Hiroshima**

Type and severity of injury	Percent of total injured <sup>2</sup> (510 persons)	Type of protection			
		Outdoors		Indoors	
		Unshielded (84 persons)	Shielded (47 persons)	Japanese-type building (276 persons)	Heavy building (103 persons)
Burns, flash.....	21	63	35	12	
Moderate.....	17	49	31	10	
Severe.....	4	14	4	2	
Burns, flame.....	.2			.4	
Moderate.....	.2			.4	
Severe.....					
Burns, not specified as to type or severity.....	7	18	11	5	
Mechanical.....	69	29	53	80	
Moderate.....	27	22	28	28	
Severe.....	42	7	25	52	
Radiation.....	85	86	89	89	
Moderate.....	20	33	15	16	
Severe.....	57	50	66	64	
Questionable.....	8	3	8	9	

<sup>1</sup> Excludes 296 persons who died in hospitals shortly after the explosion.

<sup>2</sup> Percentages in this table add to more than 100 since many persons had more than 1 type of injury.

**Table 8. Persons with mechanical injuries, by location and type of protection <sup>1</sup>**

Location and type of protection	Mechanical injuries		
	Total	Severe	Percent severe
3,280 feet or less			
Outdoors:			
Unshielded.....	33	9	27
Shielded.....	30	17	46
Indoors:			
Japanese-type building.....	308	187	61
Heavy building.....	110	68	55
3,281-6,560 feet			
Outdoors:			
Unshielded.....	176	53	30
Shielded.....	168	69	41
Indoors:			
Japanese-type building.....	909	482	53
Heavy building.....	164	102	62
6,561-13,120 feet			
Outdoors:			
Unshielded.....	143	38	27
Shielded.....	73	29	40
Indoors:			
Japanese-type building.....	690	331	48
Heavy building.....	22	11	50

<sup>1</sup> This table omits the records of 85 autopsied persons since the severity of injury was not recorded by the physicians.

histories and interviews obtained by physicians of the Joint Army-Navy Commission which investigated the medical effects of the atomic bombs in Japan within a few months after the explosions. Pertinent observations are these:

All the exposed persons were within 13,120 feet from ground center of the explosion; 816 were within 3,280 feet; 2,844, from this distance through 6,560 feet; 2,122, from 6,561-9,840 feet; and 561, from 9,841 through 13,120 feet. These were survivors who were able to escape from the area of greatest damage either alone or with a minimum of assistance.

Forty-two percent of the exposed persons were reported as being out of doors at the time of the explosion, and 2,040, or 76 percent, of these were presumably not shielded and so were exposed to the full effects of the explosion.

The majority (3,249) of the 3,653 persons who were reportedly indoors were in buildings of light or Japanese-type construction, and 404 were in buildings of heavy construction.

The percentages of persons who were uninjured increased with increasing distance from ground center. Only 47 of the 1,207 uninjured persons interviewed stated that they were in heavy buildings at the time of the explosion.

Mechanical injuries (lacerations and contusions) were by far the most common type of injury, occurring in 58 percent of the injured, 82 percent of those who were indoors, and 28 percent of those outdoors.

Burns (flash burns in 2,311 and/or flash and flame burns in 11 instances) occurred in 45 percent of the injured survivors; in 17 percent of those indoors as compared to 80 percent outdoors.

Radiation injury, recorded for 34 percent of the injured survivors, occurred chiefly among those who were within 6,560 feet of ground center. The overall percentages of those indoors and outdoors with radiation effects were 39 and 27, respectively.

Although two-thirds of the injured survivors had only 1 type of injury, the same fraction of those within 3,280 feet of ground center had multiple injuries. Radiation was by far the most common injury in this first distance zone.

When the type of protection or lack of protection was considered, it appeared that mechanical injuries were noted more frequently among survivors in buildings than among those who were outdoors, and significantly more often in the relatively few survivors who had been in heavy buildings than among the large number who were in the Japanese-type structures. At a distance within 3,280 feet, 63 percent of the injured persons had mechanical injuries, in conjunction with radiation, burns, or a combination of both in 55 percent. Beyond this distance, the majority of those with mechanical injuries had no other type of injury.

Mechanical injuries classified as the most severe of the injuries sustained were noted more often for survivors in buildings and those outdoors who were shielded to some extent than for those who were entirely unprotected from the effects of the explosion.



## REFERENCES

- (1) Oughterson, A., LeRoy, V., Liebow, A., Hammond, E., Barnett, H., Rosenbaum, J., and Schneider, D.: Medical report of the Joint Commission for Investigation of the Effects of the Atomic Bomb in Japan. Vols. I-VI. Unpublished.
- (2) U. S. Strategic Bombing Survey: Reports. Pacific War, 3. Washington, D. C., U. S. Government Printing Office, 1946.
- (3) Folley, J. H.: Incidence of leukemia in survivors of the atomic bomb in Hiroshima and Nagasaki, Japan. *Am. J. Med.* 13: 311-321 (1952).
- (4) Atomic Bomb Casualty Commission: Semiannual report, July-December, 1952. Unpublished.
- (5) Governor, Hiroshima Prefecture: Japanese atomic report for the city of Hiroshima, Japan. (Translation of Japanese document.) August 21, 1945.
- (6) Hirschfelder, J. O., Kramish, A., Glasstone, S., Parker, D., and Smith, R.: The effects of atomic weapons. Washington, D. C., U. S. Government Printing Office, 1950.
- (7) Liebow, A. A., Warren, S., and DeCoursey, E.: Pathology of atomic bomb casualties. *Am. J. Path.* 25: 853-1021 (1949).
- (8) Army Medical College, Tokyo: Medical report of the atomic bombing in Hiroshima, 1946.
- (9) Reynolds, M. L., and Lynch, F. X.: Clinical symptoms of radiation sickness, time to onset and duration of symptoms among Hiroshima survivors in the lethal and median lethal ranges of radiation. *Mil. Surgeon* 111: 360-368 (1952).
- (10) Cassen, B., Kistler, K., and Mankiewicz, W.: Some effects of air blast on mechanically constrained mice. Report No. UCLA-166, Atomic Energy Project. Berkeley, University of California School of Medicine, 1951. 18 pp.

## FDA Tolerances for Food Crop Pesticides

Procedural regulations issued by the Food and Drug Administration, Department of Health, Education, and Welfare, under the new pesticide amendment to the Federal Food, Drug, and Cosmetic Act went into effect March 6, 1955.

Under the new law, which becomes fully effective July 22, 1955, one year following its enactment, unless extended, food shipments bearing residues of pesticide chemicals in excess of established tolerances will be contraband and subject to seizure as adulterates.

Protection of the public under the law with a minimum of legislation is the aim of the Food and Drug Administration, hence, regulations establishing procedures for determining safe tolerances for pesticide chemicals were published in the *Federal Register*, February 4, 1955, pp. 770-771. However, petitions from chemical manufacturers have been processed according to the terms of tentative regulations published October 20, 1954, and the final regulations will not affect the petitions so processed. Any action taken in compliance with the tentative regulations will be regarded as complying with the law.

The final form of the procedural regulations differs from the tentative regulations principally in the following particulars:

1. A time limit of 15 days is established within which FDA must notify a petitioner of acceptance or nonacceptance of his petition.
2. Rewording makes it clear that a firm need submit a set of toxicity data to FDA only once.
3. An incomplete petition may be filed if the petitioner insists upon it.
4. A petition may be filed before a sample requested by FDA has been furnished.
5. Rewording provides a more definite time limit for consideration of a petition or request by an advisory committee.
6. The fee provisions of the regulation are changed to result in a more equitable assessment of the costs of the service. (The total cost of the service to the pesticide industry is now estimated to be slightly less than the original estimate.)

Regulations fixing tolerances for 28 pesticides that were in common use prior to the passage of the new law are still being reviewed by the Food and Drug Administration.

# A Reappraisal of Tuberculosis in Florida

By CLARENCE M. SHARP, M.D., SIMON D. DOFF, M.D., EVERETT H. WILLIAMS, Jr., M.S.,  
and ROBERT M. THORNER, M.B.A.

IN RECENT YEARS the tuberculosis mortality rate in Florida has diminished rapidly, declining from 17.9 per 100,000 population in 1951 to 16.9 in 1952 and to a low of 9.7 in 1953. The 1953 rate is substantially below the national rate of 12.5 as estimated from the 10-percent sample of death certificates filed with the National Office of Vital Statistics, Public Health Service (1). Only 303 deaths from tuberculosis among Florida residents were recorded during 1953, and for the first time in the history of death statistics in Florida, tuberculosis was not among the 10 leading causes of death.

It is unfortunate that mortality statistics provide the most frequently used measure of disease problems. They indicate poorly the trend of the incidence and prevalence of infectious chronic diseases such as tuberculosis because of the time lag between infection and death. Mortality statistics alone, as an indication of the magnitude and trend of the tuberculosis problem, are especially unsatisfactory, since improved therapeutic techniques have decreased the proportion of tuberculosis cases terminating in death. However, the rapid decline in mortality and the impending reduction in funds

available for tuberculosis control indicated a reappraisal of the tuberculosis problem and the present methods of X-ray case finding in Florida.

For this reappraisal, statistics collected from the 1953 X-ray screening in Florida were analyzed to develop an estimate of the prevalence of undetected cases in the general population.

An estimate of the number of undetected cases, when used with statistics on known cases derived from the tuberculosis case register, offers a much more satisfactory basis for planning a tuberculosis control program than does the use of mortality statistics alone. Estimates of prevalence made on an annual basis over a period of years will also indicate the trend of the tuberculosis problem more satisfactorily than will mortality figures.

These statistics of known cases and estimated undetected cases offer a good basis for the appropriation of tuberculosis control funds by State and local governments for use in planning hospital facilities and nursing services, for the operation of X-ray case-finding programs, and for the activities of the tuberculosis association.

During 1953, State and local health units in Florida made 70-mm. X-ray films of 382,304 persons. Of these films, 8,882 were interpreted as showing some type of pathology. A total of 4,448 were interpreted as indicative of tuberculosis (table 1).

Followup films were made on 2,762 patients showing signs of definite or suspected tuberculosis. A definite diagnosis of tuberculosis

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t previously known to the State board of health was established in 497 cases, yielding a new case rate of 130 per 100,000 persons screened on the original 70-mm. X-rays. Since the followup of the original screenings is only 62 percent complete, the actual rate probably much higher. Hospitalization was recommended for 191 patients.

### The X-ray Screening Survey

Included in the 70-mm. X-rays were 148,240 exposures made for "mass screenings," principally by mobile units of the State board of health. As more complete information concerning both the persons X-rayed and the results of followup was available for this group, detailed analysis was made from these data. The age, race, and sex distribution of this group is compared to the general population and found to differ significantly. However, on the basis of available information, adjustments were made for these factors and statistical inferences were drawn regarding the prevalence of undetected tuberculosis in Florida. The methodology and results of this analysis are presented in this paper.

The 29 Florida counties surveyed (map) are not randomly distributed throughout the State, but are concentrated in western and south-

western Florida. Three universities located in counties not shaded on the map were also included in the survey. Since the survey was not intended primarily as a statistical study, no attempt was made to insure a random sample. The survey was made to find and bring to treatment cases of tuberculosis, and the statistics available represent a byproduct.

Counties were selected for screening on the basis of the time elapsed since a previous survey of that county. The mean elapsed time between the last survey of the counties in the study and the 1953 survey was 24.7 months, ranging from 11 months to 71 months. The length of elapsed time between surveys is undoubtedly a factor in the number of tuberculosis cases detected. A correlation between the time elapsed and the size of the new case rate in the counties surveyed showed a positive coefficient of  $r=.41$ . This correlation is significant statistically at the 5-percent level. Since the counties not included in the survey had been screened more recently than those included, some upward bias has been introduced into the prevalence estimate by this factor.

This bias has probably been more than offset by the fact that the counties surveyed are predominantly rural, and the counties containing Florida's largest cities are not in the area surveyed. Since tuberculosis case rates are generally higher in large cities, the geographic distribution of the counties included would tend to have a downward influence on the prevalence estimate (2).

Another factor exerting a downward bias upon the estimate of prevalence is the inherent assumption that nonrespondents to the survey would show a proportion of tuberculosis similar to that of the screened population. There is some indication that a higher proportion of the population which did not voluntarily respond to the survey would show signs of definite or suspected tuberculosis (3).

The methodology of the survey was typical of mass X-ray screenings of the general population. Advance publicity was given to the arrival of the survey unit. The X-ray team set up shop in a prominent location and photographed all persons 15 years of age or older volunteering.

These 70-mm. films were then read, chiefly

Table 1. Results of 70-mm. X-ray screenings and 14" x 17" followup films, Florida, 1953

Diagnosis	Number
Total 70-mm. films <sup>1</sup> -----	382, 304
finite or suspected tuberculosis-----	4, 448
radiovascular pathology-----	1, 560
morbid-----	170
other pathology-----	2, 704
negative-----	373, 422
Total 14" x 17" followup films <sup>2</sup> -----	2, 762
new cases-----	497
old cases-----	434
suspected tuberculosis-----	206
calcification-----	106
other pathology-----	437
agnosis reserved-----	224
negative-----	858

<sup>1</sup> Excludes unsatisfactory films.

<sup>2</sup> Followup of 70-mm. films with impressions of definite and suspected tuberculosis.

As a result of these followup films, 187 new tuberculosis cases were definitely diagnosed, yielding an unadjusted case rate of 126.1 per 100,000 adults successfully X-rayed by the original 70-mm. films.

Since information regarding the age, race, and sex was collected at the time the survey X-rays were taken, it was felt that a good estimate of the number of undetected cases of tuberculosis could be made by use of these data.

The race, sex, and age distributions of the 145,267 negative X-rays were estimated from this sample, and the distribution of the films with pathological findings was added to this to derive an estimate of the distribution of all of the 70-mm. films taken.

Since 1953 was fairly close to the census year of 1950, information concerning the race and sex distribution of the population of Florida in 1950 was used as a standard against which to

Race, sex, and age	Florida	Survey population	Percentage distribution <sup>1</sup>	
			Florida	Survey population
Total.....	2, 045, 502	148, 240	100. 0	100. 0
Race and sex:				
White male.....	795, 238	54, 820	38. 9	37. 2
White female.....	827, 465	59, 876	40. 4	40. 8
Nonwhite male.....	203, 713	16, 971	10. 0	11. 6
Nonwhite female.....	219, 086	15, 208	10. 7	10. 4
Unknown.....		1, 365		
Age:				
15-24.....	595, 027	46, 418	19. 3	32. 0
25-34.....	440, 625	28, 530	21. 5	19. 7
35-44.....	412, 153	27, 297	20. 2	18. 8
45-54.....	324, 207	20, 324	15. 9	14. 0
55-64.....	236, 016	13, 185	11. 5	9. 1
65 and over.....	237, 474	9, 408	11. 6	6. 4
Unknown.....		3, 078		

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judge the representativeness of the surveyed population. The adult population of Florida was distributed on a percentage basis by age, race, and sex, and these percentages were used as a theoretical set of frequencies for comparison with the survey group (table 2).

The persons of known age, race, and sex in the survey group were redistributed according to the theoretical frequencies, and a chi square test made. The survey group was found to fit the theoretical distributions poorly, chiefly as a result of the large number of university stu-

**Table 3. Film impressions of 70-mm. mass X-ray screenings, by race, sex, and age, Florida, 1953**

Race, sex, and age	Total films <sup>1</sup>	Percent of population <sup>2</sup>	Film impression				
			Definite or suspected tuberculosis	Cardiovascular	Tumor	Other pathology	Negative
Total.....	148,240	28.0	1,344	597	66	966	145,267
Race and sex:							
White male.....	54,820	27.0	623	141	23	456	53,577
White female.....	59,876	29.4	427	170	23	313	58,943
Nonwhite male.....	16,971	32.0	187	138	13	114	16,519
Nonwhite female.....	15,208	26.6	96	139	5	74	14,894
Unknown.....	1,365	-----	11	9	2	9	1,333
Age:							
15-24.....	46,418	39.6	157	51	1	103	46,106
25-34.....	28,530	26.3	130	28	6	83	28,283
35-44.....	27,297	27.5	193	49	5	161	26,889
45-54.....	20,324	26.6	263	112	16	175	19,758
55-64.....	13,185	23.3	251	104	18	185	12,627
65 and over.....	9,408	15.9	314	245	19	235	8,595
Unknown.....	3,078	-----	36	8	1	24	3,009

<sup>1</sup> Excludes unsatisfactory films.

<sup>2</sup> Based on 1953 estimated corresponding population group in counties surveyed.

**Table 4. Findings on followup by 14" x 17" X-ray of definite or suspected tuberculosis, mass X-ray screenings, Florida, 1953**

Race, sex, and age	Follow-up films	Percent follow-up	Findings						
			New cases	Old cases	Suspected tuberculosis	Calcification	Other pathology	Diagnosis reserved	Negative
Total.....	1,011	75.2	187	142	82	19	191	79	311
Race and sex:									
White male.....	478	76.7	80	83	35	8	104	50	118
White female.....	333	78.0	60	44	26	9	60	22	112
Nonwhite male.....	132	70.6	35	10	12	1	14	6	54
Nonwhite female.....	63	65.3	11	4	8	1	13	1	25
Unknown.....	5	-----	1	1	1	-----	-----	-----	2
Age:									
15-24.....	119	75.8	12	5	8	1	19	2	72
25-34.....	102	78.5	23	22	3	1	8	10	35
35-44.....	141	73.1	37	26	9	1	26	6	36
45-54.....	200	76.0	45	27	24	5	31	15	53
55-64.....	194	77.3	33	26	22	7	36	22	48
65 and over.....	238	75.8	34	33	16	4	70	24	57
Unknown.....	17	-----	3	3	-----	-----	1	-----	10

dents included, and was judged not to be representative of the total Florida population.

To compensate for the poor correspondence of the survey population to the general population, age-specific rates were computed and used to derive an estimate of the number of undetected cases in Florida.

Rates were developed for specific population groups based on a cross tabulation by age, race, and sex of the 187 new cases, and the corresponding number of persons in each age, race, and sex group of the surveyed population. The estimated adult population of Florida as of July 1, 1953, was prorated according to the age, race, and sex distribution of the 1950 census. The age-specific rates were then applied to each population group to derive an estimate of undetected cases in 1953.

This procedure introduces many possibilities for error. The number of cases in each age bracket is small, and the rates correspondingly irregular. The age distribution of the population has undoubtedly changed since 1950, and the projected population also must vary from the actual to some degree. However, it is believed that the method is reasonably accurate and is considerably better than an estimate based on the unadjusted case rate.

One additional adjustment was believed necessary to derive a prevalence of undetected cases in 1953: an adjustment for incomplete followup of the definite and suspected cases detected on the 70-mm. films.

The film impression results, percent followup by race, sex, and age, and new cases found appear in tables 3-5. No significant difference in percent followed (at the 5-percent level) could be found for the two most divergent age groups, or by race (table 4). It was therefore decided that the overall followup percentage (75.2) could be used as an adjusting factor if it were assumed that a similar proportion of the cases lost to followup would have been definite tuberculosis cases. The adjusted figure for undetected cases in 1953 is 4,856, and the rate 211.1 per 100,000 adult population.

To this figure may be added the 11,608 known cases of active, questionably active, and inactive pulmonary tuberculosis under supervision by local health departments in 1953, yielding a prevalence estimate of 16,464 known and undetected cases.

In contrast to the small number of deaths, 303, these figures indicate that tuberculosis remains a major health problem in Florida.

**Table 5. Activity and stage of new cases found, by race, sex, and age, mass X-ray screenings, Florida, 1953**

Race, sex, and age	Total	Stage				Activity			New case rate <sup>1</sup>
		Minimal	Moderately advanced	Far advanced	Unknown	Active	Inactive	Undetermined	
Total.....	187	76	87	12	12	49	59	79	126.1
Race and sex:									
White male.....	80	38	32	5	5	22	27	31	145.9
White female.....	60	25	27	1	7	10	27	23	100.2
Nonwhite male.....	35	7	22	6		14	2	19	206.2
Nonwhite female.....	11	5	6			3	2	6	72.3
Unknown.....	1	1					1		
Age:									
15-24.....	12	3	8		1	8	2	2	25.9
25-34.....	23	5	14	3	1	12	5	6	80.6
35-44.....	37	16	14	4	3	11	6	20	135.5
45-54.....	45	17	24	2	2	10	14	21	221.4
55-64.....	33	13	15	1	4	4	17	12	250.3
65 and over.....	34	20	12	1	1	2	14	18	361.4
Unknown.....	3	2		1		2	1		

<sup>1</sup> Rate per 100,000 satisfactory 70-mm. films.

## Administrative Uses

Administratively, several important facts became apparent as a result of the detailed analysis. While the case rate increased considerably with age (table 5), the proportion of the population surveyed became progressively smaller with age (table 3). Case rates were higher for males than for females (table 5), but a relatively constant proportion of each sex group was surveyed. Evidently, case-finding efforts will yield greater returns if a greater proportion of older persons and males can be screened.

The largest proportion of cases found (87.2 percent) were in the minimal or moderately advanced stages, indicating that the mass screening technique is successful in finding cases at a stage when treatment of active cases or supervision of questionably active cases can be most successfully undertaken.

The distribution of new cases by activity is based chiefly on the reading of the 14" x 17" followup films and only in part on clinical study. The proportion of active cases decreased progressively with age, and the proportion of cases with activity undetermined tended to increase. This has probably resulted from the difficulty of making a diagnosis from 14" x 17" chest X-ray films in older persons who are more likely to have calcification, fibrosis, and caseation, whereas the younger patients are more apt to have exudative lesions and present less difficulty in determining activity.

## Future Plans

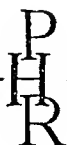
The productivity of X-ray screening will, of course, diminish as the prevalence of tuberculosis is reduced, and the cost per case found will increase correspondingly. It is difficult to assess at what point the yield of the X-ray technique does not justify the expenditure.

In Florida, the 1953 X-ray screenings yielded 497 new cases. There are no figures available showing how many additional cases resulted from the followup of contacts of these infected persons, but this number is believed to be substantial. It would seem that this method of case finding is still sufficiently productive in Florida to warrant its continuance.

As the prevalence of tuberculosis is further reduced, the X-ray screening program will be directed toward those areas and age, race, and sex groups which will yield the greatest number of cases as indicated by the present general surveys.

## REFERENCES

- (1) Estimated numbers of deaths and death rates for selected causes: United States, 1953. Annual summary for 1953, part 2. Monthly Vital Statist. Rep. 2 (No. 13): 13-12, June 18, 1954.
- (2) Community-wide X-ray surveys, 1945-1953, conducted with Public Health Service assistance. Pub. Health Rep. 68: 546-548, May 1953.
- (3) Iskran, A. P., and Remein, Q. R.: Effect of incomplete information on estimating prevalence of disease. Pub. Health Rep. 67: 384-389, April 1952.



# *The State of the Nation's*

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Excerpted reports from the 53d Annual Conference of the Surgeon General of the Public Health Service and the Chief of the Children's Bureau with the Association of State and Territorial Health Officers and with State Hospital and Mental Health Authorities, December 6-10, 1954, Washington, D. C.

## Health Action Programs To Meet The Needs of Today

**1** By Oveta Culp Hobby  
Secretary of  
Health, Education, and Welfare

These annual meetings give us in the Department of Health, Education, and Welfare an opportunity to find the ways in which the local, State, and Federal governments can best work together for the better health of the American people.

During the coming year we in the Department are going to place primary emphasis on health and on the means through which we may move toward its improvement throughout the Nation.

In today's world the prospect of better health and of longer, happier lives for the American people now is not a distant dream. This Administration has set itself the task of narrowing the gap between what is possible and what is actual.

President Eisenhower has left no doubt regarding the vigor with which a health program will be pushed. As the President said in his speech at the Alfred E. Smith Foundation in October:

"The start now made is only a first beginning on a vast human enterprise—the health of our Nation. This is a task for the individual citi-



zen, the city, the county, the State, and finally, the Federal Government. We Americans have accomplished near miracles in material things. But we are years behind our potential achievement in the availability and adequacy of health services. That deficiency we shall correct.

"But I repeat, the task does not belong exclusively or even primarily to the Congress and the Government. It belongs to each of us and to the communities in which we live. The inadequacy will be fully remedied only as each of us performs his full duty as an American citizen, certain that in so doing he is not only relieving distress but making a more durable contribution to the Republic."

Sound legislation is one of the requisites for action. The last Congress, as you are aware, enacted two important measures directed toward today's health problems. These broadened and extended the Hospital Survey and Construction Program and substantially expanded the Federal-State program to rehabilitate the handicapped.

As a result, you—and your colleagues in communities throughout the Nation—are already, or will shortly, have a part in planning the construction of badly needed chronic disease hospitals, nursing homes, rehabilitation centers, and diagnostic and treatment clinics. More disabled people will be returned to active, useful lives. There will be more facilities and more services for the care of older people and those chronically ill.

These are forward steps. They are in keeping with our efforts to see that health programs and activities are designed to meet today's needs rather than yesterday's crisis or tomorrow's imponderables.

One of our important objectives has been to encourage the growth and improvement of voluntary health insurance so that more people can be protected against the costs of illness. To this end the President has proposed a system of voluntary health reinsurance.

## In Exploratory Stages

Many of the health problems which need planning and action are as yet in the exploratory or preliminary stages. I would like, however, to mention some of the problems.

Many of you here have a deep interest, for example, in the problems of air pollution and of water pollution. Some States have already undertaken, in cooperation with local communities, remedial efforts. The President has expressed his deep concern about air and water pollution problems. Certainly there is a great need for expanded activity here, particularly in the way of research and field investigations.

## Juvenile Delinquency

Another grave national problem is juvenile delinquency. The Department has been studying methods by which the Federal Government can assist States and local communities in meeting this serious social problem, with its important health implications.

New concepts are emerging which point to ways health departments can help prevent delinquency. Mental health principles are being increasingly employed in health and treatment centers serving parents and children. Certainly those of you who are administering mental health programs have a great deal to contribute in the battle against delinquency.

To combat juvenile delinquency, the Congress made a supplemental appropriation of \$75,000 to the Children's Bureau. This appropriation will enable the Bureau to aid States, local communities, and other groups to plan, coordinate and improve the services they provide for delinquent children.

## The Field of Civil Defense

This Department has recently received by delegation from the Federal Civil Defense Administration some very serious responsibilities in the field of civil defense. In approving this delegation, the President has again indicated the importance with which he regards this program in planning for national welfare and security.

Many of you have already done considerable work in planning for casualties in the event of local disaster. We must give increasing attention to the problem of maintaining living conditions as close to normal as possible in the face of the confusion and dislocation which would follow such a disaster. As a result of the recent

delegation of authority, the Department can now work with you in developing a coordinated national approach.

In connection with this activity, I should like to make special note of the Public Health Service's plans for substantial expansion of the Commissioned Reserve. The principal reason for this, of course, is to provide a corps of trained public health workers for service in national emergencies. Its immediate goal is the commissioning of an additional 2,000 reserve officers by June 30, 1955.

Another recent significant event has been the congressional transfer of the health and hospital services for the Indian people from the Bureau of Indian Affairs to the Public Health Service.

## State-Federal Relations

The Department is going to need your help in the solution of this complex problem. Effective use of our existing local-State-Federal machinery for preventive services and disease control will give us our best chance for success.

It is through the established pattern of combined local, State, and Federal action on health problems that we can reach our mutual goals of a stronger and healthier America. The philosophy of Federal-State relations held by this Administration, and by the Department, coincides closely with your own. Some of our basic beliefs parallel those embodied in the proceedings of these conferences over the years.

Let me conclude by restating a few. We believe:

That the States and the Federal Government are interdependent in the fight against disease and disability.

That the Nation as a whole must share responsibility for those State and local public health services of national or interstate significance.

That when more effective methods of combating health problems are developed, assistance should be made available for their nationwide application.

That all this should be done with a maximum of State and local initiative, decisions, and State responsibility—and with a minimum of Federal control.

On these principles, the work of the Department has gone forward. With this philosophy, I am convinced, we can continue to meet today's health needs, and tomorrow's.

# Breaking the Trail For New Public Health Advances

# 2

By Leonard A. Scheele, M.D.  
Surgeon General of the  
Public Health Service

In this meeting, you and I are carrying out a statutory responsibility first placed upon the Nation's Federal and State health agencies more than half a century ago. The State and Territorial health officers, together with the State hospital and mental health authorities, comprise the largest group of official advisers to the Public Health Service.

As your chairman, I wish to place before you a few of the important events that have occurred in the Public Health Service since we last met. This I propose to do first, and then to discuss with you the orientation of public health to deal more effectively with the major health problems of today.

## Facilities Construction and Rehabilitation

I need not elaborate on the provisions of the Medical Facilities Survey and Construction Act of 1954. The Public Health Service has been meeting with State and Territorial hospital authorities and with representatives of the many other groups involved in the program. The Federal Hospital Advisory Council has met twice to discuss and pass upon regulations, to be issued officially on or before January 1, 1955. A supplemental appropriation, providing \$2 million for State surveys and \$21 million for construction grants, has been passed.

With publication of the regulations, the way will be clear for the States to complete their surveys and develop their plans for construction in the neglected fields of chronic disease facilities, diagnostic treatment facilities, nursing homes, and rehabilitation facilities. We look forward to the development of a program as successful in improving the Nation's health as the original Hill-Burton program. We all have a fine opportunity to help fill important gaps in the Nation's physical resources for health, specifically in resources for care of the long-term patient.

## Vocational Rehabilitation

The expanded rehabilitation program administered by the Office of Vocational Rehabilitation offers another opportunity for progress. I had the privilege recently of addressing the National Rehabilitation Association at its annual meeting. The association is one of the major voluntary agencies in its field and counts in its membership State and Territorial directors of vocational rehabilitation and services to the blind. It seemed to me significant and prophetic of future cooperation that they should invite a health officer to deliver their keynote address.

I urged your counterparts in the field of rehabilitation to seek the cooperation of their official health agencies. So I urge you to increase your cooperation with State directors of rehabilitation and services to the blind. As staunch allies, our State health and rehabilitation agencies have it in their power to bring about real advances in care of the handicapped and in control of chronic diseases and care of the aged.

## Indian Health Services

The transfer of hospital and health facilities for American Indians to the Public Health Service was accomplished with the approval on August 5, 1954, of Public Law 568, 83d Congress.

Besides the obligation to develop and operate an adequate hospital and medical care program for the Indians, the Service is challenged to apply the public health methods which we know

can greatly reduce Indian mortality and morbidity owing to preventable diseases. We expect to encounter problems like those with which our health missions are dealing in foreign countries. Indian health problems are often the problems of people who retain their primitive cultures and who have never known high standards of living or high quality health services.

Just as the Public Health Service and the States have worked together in helping to solve similar problems overseas, we will also be calling on you for advice and active support in the Indian health program. This includes your active help in recruiting personnel. We hope that State and local agencies will be able increasingly to provide a larger share of direct health services to Indians. We plan to increase emphasis on preventive services, on early case finding and treatment, and on improved medical care in the ambulatory clinics and hospitals.

## Water Resources and Pollution

The Nation's problem of water resources is receiving intensive study at the highest policy levels of Government. The Public Health Service is participating actively in the work of the President's Cabinet Committee on Water Resources Policy as well as in the work of the new Interagency Committee on Water Resources.

Water pollution control is a vital factor in water resources development. Water shortages can sometimes be met through construction of dams to store water for use as needed. The solution, however, must be found in the preservation of water quality through pollution control. This permits repeated use of water as streams flow from city to city and from industry to industry.

It is always easier to get public and official support for the development of new sources of water supply and for water treatment facilities than for treatment of sewage and wastes. No one wants to worry about unglamorous waste treatment so long as sewers carry away the wastes.

"Out of sight, out of mind" is a dangerous attitude toward sewage and wastes. I hope that you will use your influence to disabuse the public and State and local government officials of this attitude. They must be made aware of the

critical need for waste treatment works. Water works have advantages today which are not provided sewage treatment works. A real need is to develop better methods for financing sewage treatment as an integral part of the community's total water service.

## In Civil Defense

The Federal Civil Defense Administration has delegated specific authorities to the Department of Health, Education, and Welfare. Those for which the Public Health Service is responsible include: (a) research, primarily in the fields of biological and chemical defense; (b) development of a national program of technical guidance to the States and direction of Federal activities for the emergency restoration of community public health services; and (c) provision of Reserve Corps officers for emergency service in heavily damaged areas.

The National Institutes of Health, the Communicable Disease Center, and the Robert A. Taft Sanitary Engineering Center are working on projects in cooperation with the Armed Forces, the Atomic Energy Commission, and the FCDA. The Office of Health Emergency Planning in the Office of the Surgeon General remains the coordinating unit in the Public Health Service and is our primary liaison with these key agencies.

An expanded defense training program for key personnel of the Public Health Service is now under way. A main purpose is to develop new materials and instructional activities for State and local health personnel. The Service will be concerned not only with technical problems but also with administrative methods for utilizing all public health resources in an emergency.

## Commissioned Reserve Corps

Perhaps the most challenging of our new defense responsibilities is the development of a more adequate Commissioned Reserve Corps in the Service. World War II proved that to be effective a Commissioned Reserve should be recruited in peacetime and adequately trained for duty in emergencies. The plan is to take those steps now and thus avert conditions which

were unsatisfactory to all concerned during the last war.

Our aim is to augment—not to deplete—the available supply of personnel for duty in public health activities and to assure their mobility. In developing the Commissioned Reserve we will work out with you plans for the most effective training and utilization of existing health personnel. At the same time we will recruit actively outside State and local public health staffs.

We will use every available resource to train reserve officers in the health problems associated with atomic, biological, and chemical warfare, and other emergency health problems. We do not expect to call officers in the emergency reserve to active duty without their consent, except in the face of a clear and present danger, publicly recognized.

It is to the self interest of every health officer and his staff to promote the development of the Commissioned Reserve.

## The Goals of Public Health

The fundamental goals of public health have not changed with the changing years and the changing world. Our professional forefathers set those goals in broad terms that are as relevant to our times as to theirs.

Shattuck in 1850 wrote:

"The conditions of perfect health, either public or personal, are seldom or never attained, though attainable . . . The average length of human life may be very much extended and its physical power greatly augmented . . . A vast amount of unnecessarily impaired health and physical debility exists among those not actually confined by sickness . . . These preventable evils require an enormous expenditure and loss of money and impose upon the people unnumbered and immeasurable calamities, pecuniary, social, physical, mental, and moral, which might be avoided . . . Means exist, within our reach, for their mitigation or removal . . . Measures for prevention will effect infinitely more than remedies for the cure of disease."

Please note that no particular groups of diseases, no special population group is singled out as the proper objective of public health action. There is no narrow definition of the means

by which the goals of personal and public health shall be attained. save an affirmation of the universal truth that prevention is more effective than cure. The goal is not merely to extend life but to augment its power. The full physical, mental, economic, and social impact of ill health is recognized as the proper target of public health action; and prevention includes "mitigation or removal."

These are the problems and goals of public health today. The fact that the major causes of death and ill health have changed does not remit one single clause in the public health charter of responsibility.

There is a tendency to restrict these problems and goals to a narrow vision of conquering specific disease entities by specific techniques. We are challenged, therefore, to throw off our blinders and see. As the specific problems have changed, so our approaches to, and methods for, their solution must change also. Even the traditional fields, sanitation and communicable disease control, demand new approaches and methods.

## Air Pollution

I would like to give you one illustration of the lag in attacking new problems in these old fields.

Air pollution is a chronic, massive problem for virtually every large city in the country. In the past 6 years, the public concern about air pollution has reached fever pitch in some urban areas.

There has been a notable lack of interest and action in State and municipal health agencies and in some of the Federal services. When we mention Pittsburgh, St. Louis, New York City, and Los Angeles, we have just about called the roll of metropolitan areas which have had any major control effort leveled at their problems of air pollution.

No one has yet developed fully effective control measures for all types of air pollution, especially for the invisible fumes and gases discharged into the general atmosphere.

We do not have epidemiological data to compare a generation's experience in exposed and control populations. But there is a body of information—engineering, chemical, meteorological,

logical, and medical—which confirms the public concern and which would provide a beginning measure of control, if applied. However, there is a basic need for intensified research by all groups concerned: industry, private laboratories, communities, States, and Federal agencies.

We also need intensive scientific study of many other unsolved problems in environmental health and in communicable disease control. Such studies absorb a significant proportion of the Nation's total medical and public health research expenditure; and they will eventually yield results that may radically change our approaches and methods in these traditional fields. But real improvements can be made now, by applying what is known today. We cannot deal with the chemical and viral threats to health by a "swivel-chair" approach, nor by chief reliance on methods learned even 20 years ago.

There must be a critical appraisal of our methods in all fields and a shift of our public health efforts away from the obsolete activities. Even more important, we must orient our young professional staffs in the new problems public health faces. If we do not make these changes, I fear that public health departments will not play the significant role which should be theirs in helping the Nation to lift the physical, mental, social, and financial burden of long-term illness. New State and local agencies will continue to be created, outside established health departments, to deal with this transcending health problem. The fragmentation of health services will continue, while many health departments, with fine records of past accomplishment, will be left at the starting post.

## Long-Term Illness

Long-term illness cannot be defined nor successfully attacked in terms of specific disease entities and their specific control. The roots of long-term illness are in a vast multiplicity of causes, some of which are known, and many of which are unknown. Long-term illness reaches into every segment of individual and community life.

Last spring the Commission on Chronic Illness called a conference on care of the long-term patient. The title of the conference was

no idle choice; it places the focus where all future effort in the control of chronic diseases must be placed—on the patient. I commend the recommendations and proceedings of that conference to your earnest study.

We cannot fail to be impressed by the growing body of medical knowledge and professional skills ready for application to the problems of the long-term patient, as well as with the increasing number of community experiments with new types of service for the chronically ill and the handicapped. However, our public health methods for tapping these resources and applying the new skills are, on the whole, deficient.

This leads me to suggest a refocusing of public health attention—on the individual patient. If we are to maintain our front-rank position in the maintenance of the Nation's health, we must work more effectively with medical practitioners and with a wider range of voluntary and official agencies concerned with prolonged illness. All of us must become better specialists in dealing with people, and more expert in the organization of resources for the care of the long-term patient.

## Coordination of Services

Our experience in attempts to control specific diseases by means of specific techniques has clearly revealed many organization problems. It has shown us that the major barrier to good results is the lack of coordination of public health, medical, and related services in the community. We need much more research and more pilot projects in this vital area. Meantime, there are encouraging signs of a growing interest among health departments in better organization of their own resources.

Several State and large city health departments are engaged in studies or practical application of methods related to the coordination of services.

The Public Health Service has recently reorganized its Bureau of State Services and has established an Interbureau Chronic Disease Study Committee. Both actions have the purpose of integrating our operations along functional lines, and of affording better coordination with related activities in the Department

of Health, Education, and Welfare, the States, and voluntary agencies.

The New York City Health Department has recently undertaken a significant study in cooperation with the Service. The first phase of the study is to determine the extent of referral and coordination between municipal health services and the services provided by industries, organized groups such as unions, and voluntary agencies. We are confident that the findings will give clues to better methods for coordinating community health services, but we need a great deal more experience than our current efforts can provide.

Although the Nation has not gone as far as it will go in the coordination of medical and hospital services, the past 10 years have seen rapid progress in this direction. The teaching hospital and the medical center are being turned to increasingly as sources for consultation and continuing education programs for the medical and related professions in the major health problems of the day.

## Personnel Problems

We have made too little progress in the recruitment of public health personnel, especially of physicians. What are the barriers? Public Health Service studies of the engineering profession indicate that low economic reward is not the sole, nor even the determining, barrier to entering sanitary engineering. Recruitment practices proved to be poorly timed, and the information supplied to engineering students proved inadequate.

Can we do something about comparable problems in medical schools, and even in their seedbeds—the colleges and high schools? The pre-medical and medical curriculums could be enriched to show the students that public health and administrative medicine have attractions comparable with those of the clinical specialties. State health officers are in excellent position to influence educational authorities in their States in this direction.

## Need for Special Training

The Nation's medical schools are turning out a superior product in all departments. The new

medical graduate has a far better concept of the role of the general practitioner, and of the significance of psychiatry and preventive medicine than his counterpart of 15 or 20 years ago. The teaching of cancer and of cardiovascular and mental diseases also has been expanded during the past 5 or 6 years. Very few medical students in the future will reach their internships without up-to-date instruction in these important fields. In more medical schools than ever before, modern concepts of preventive medicine and environmental health are being taught as important elements of the undergraduate curriculum.

Nevertheless, the supply of physicians available for public health and medical administrative work is meager, and the majority of graduates in all the health professions still require specialized training to do a competent job in our health departments. The cutbacks in recent years in the training programs of State health departments are therefore most disturbing. Our State and local officials and legislative bodies must be made aware of the needs for special training of men and women after employment in public health.

Professional public health workers of today must be more than craftsmen skilled in the performance of specific techniques. They must be creative thinkers—problem solvers in a much larger universe of problems than they have hitherto accepted as their responsibility. They must be masters of a body of knowledge in relationships and resources, upon which they can base sound proposals for dealing with each new situation involving the health of a community and its individual citizens.

I leave you with the same challenge that has faced us each of the past 6 years I have spoken to you from this platform. It is a challenge of adjustment and adaptation to changing needs, a challenge that cannot be fully met over a lifetime.

We are beginning to see in clearer outline the total problem of prolonged disability. Means for its prevention and reduction are increasing in number and effectiveness. Our next steps should be toward a better orientation of our thought, our personnel, and our services for the application of the new knowledge—present and

to come. We must not be complacent because of our low total death rate. We must remember that with the prolongation of many more lives into older age brackets many more people are suffering the chronic and crippling illnesses of older age. These are our challenge.

## Child Health Problems: Juvenile Delinquency; Black Market in Babies

3

By Martha M. Eliot, M.D., Sc.D.  
Chief of the  
Children's Bureau

The major development of 1954 in the Children's Bureau is the creation of a new division to deal with the problems of juvenile delinquency.

The Division of Juvenile Delinquency Services will provide technical aid to States and local communities. The new division will work closely with the Bureau's Division of Health Services and expects to prepare material on the role of health departments in the prevention and treatment of juvenile delinquency.

The high point in the Bureau's efforts to deal with the problems of juvenile delinquency was a national conference, June 28-30, attended by police officers, juvenile probation officers, welfare and health workers, educators, churchmen, and others who are professionally engaged in programs on behalf of youth.

During the year a number of publications relating to juvenile delinquency were completed. One of these, "Standards for Specialized Courts Dealing With Children," was prepared in cooperation with the National Probation and Parole Association and the National Council of Juvenile Court Judges.



Other publications included "Police Services for Juveniles" and "Tentative Standards for Training Schools." Still other publications tell citizens about the nature of the problems of juvenile delinquency. Statistical and research studies have also been made.

## Black Market in Babies

Another problem of great concern is the so-called black market in babies. By this, we mean the sale of babies for profit to would-be adoptive parents. Health departments can be of major assistance in helping meet this problem.

Most of the babies involved are born to young unmarried women. Approximately 146,500 babies are born to unmarried mothers each year. Almost one-fourth of these mothers are only 17 years or younger. The black market operators take advantage of these girls at a time of deep emotional stress.

In some cities the practice of agreeing to give up the baby in advance of birth in order to have the medical bills paid has resulted in a black market that is very lucrative to the operators.

The Bureau has employed a specialist to develop plans for enlisting the cooperation of legal, medical, social work, and law enforcement groups in an effort to improve and extend social services and medical and hospital care for unmarried mothers and to eliminate or reduce unprotected placement of children in adoptive homes.

We must also concern ourselves with babies placed in families not related to the baby by persons who have every desire to help but who cannot provide the legal or social protections every adoption should have. Even though no money is exchanged, this type of unprotected placement may be just as bad for the child as one taking place in the black market.

Efforts directed in some of the following ways would of themselves result in the prevention of many unprotected placements:

State health departments can cooperate with welfare departments on the health aspects of the problem and can work with medical societies toward a better appreciation of the importance of good adoption practices.

The local health officer is often in a favorable position to bring together the several public and private agencies that are involved.

Prenatal clinics have much to offer to the care of the pregnant girls.

Public health nurses through their close knowledge of the communities in which they work are in a strategic position to assist girls in getting to social agencies and in working out arrangements for medical and hospital care during confinement.

## Mental Retardation

During the past few years a large number of parents of mentally retarded children have organized the National Association for Retarded Children and are doing a great deal to focus public interest on the needs of these children. This group, numbering about 30,000 parents, includes many who are forthright in letting it be known that they have mentally retarded children.

Although we are reexamining an old problem, we are learning that mental retardation is not in itself a single entity but includes a wide range of intellectual ability below an I. Q. of 70 or 80. Most of these children are believed to have a mental capacity that makes at least partial self-support possible to attain.

The Bureau is particularly interested in what can be done to help these children during infancy and the preschool years. This is the period when parents have doubts regarding their child's development and take him to their physician or to a child health clinic for diagnosis.

Far too often the advice is to place the child in an institution even though institutions are so crowded that there is a long waiting period and many will not accept a child until he is 6. A large proportion of these children will develop much better at home. The preschool years are a significant period for the child's development during which the parents need much help.

A program for mentally retarded children should include a special diagnostic center in connection with a pediatric program where the diagnosis can be made and where a plan can be developed for each child at an early age. On



this basis, referrals for institutional care can be made on a much more selective basis than at present.

Most parents would be much better able to care for these children at home, at least in early childhood, if such care were a part of a plan that includes followup visits to the special clinic for supervision, nursery school classes, special classes at regular schools, and social services. Such a program calls for a close working relationship on the part of the health, education, and welfare departments, and the parents of the children.

The Bureau has recently granted funds for a pilot project at the Children's Hospital in Los Angeles. We hope to employ a specialist to study how community services for mentally retarded children can be further developed. The Bureau, the Office of Education, and the National Institute of Mental Health of the Public Health Service will work to press for improvement in many aspects of this community program.

## Children of Migrants

Ten States in the east coast migrant stream met here in May 1954 for a conference sponsored by the Public Health Service, the Children's Bureau, the Office of Education, and the Bureau of Public Assistance. The States planned the agenda and during the conference developed concrete plans for action. Public and private groups within the States actively engaged in working with migrants were included.

Since the conference a number of things have happened. United efforts by a number of agencies resulted in a day care center in one Pennsylvania county. Using a special project grant from the Bureau, the Florida State Health Department has employed a coordinator of migrant activities to work in the counties with large migrant populations and to follow the families up the coast to see what they get or do not get in the way of services.

The Department is acting as a clearinghouse for information progress in the 10 States represented at the conference and is soliciting information from each to pass on to the others in the migrant stream.

Nearly 8,000 of the school transfer record

developed during the conference have been requested by the States. This is a small card which the child carries from school to school: it contains brief data on his grade placement and his health record.

The conference referred to your committee on migrants the recommendation that a similar record be developed for health. Another recommendation called for the health officer in each of the 10 States to name a representative to a task force to develop minimum standards for housing and sanitation for transient laborers.

## Maternal and Child Health

The gains of the past few years in maternal and child health have been maintained. Definite progress is being made in the prevention of retrolental fibroplasia, an unknown disease a few years ago but now the leading cause of blindness in children.

With the increasing skills we have acquired in saving the lives of premature infants, especially those weighing less than 1,500 grams, the emergence of retrolental fibroplasia as a disease of small premature infants is one of the major obstacles in their care. Some physicians, parents, and others have had misgivings about life-saving efforts which have resulted in a sharp increase in blindness among babies.

There is now strong evidence that excessive oxygen administration is the major cause of retrolental fibroplasia. This evidence comes from clinical observations and laboratory studies, from independent observations, and most recently from a national study.

## Study on Retrolental Fibroplasia

A preliminary report (September 1954) of the National Cooperative Study on Retrolental Fibroplasia represents the first 6 months' experience of 75 pediatricians and ophthalmologists in 18 hospitals over the country. Premature infants who weighed 2,500 grams, or less, at birth and who survived 48 hours were assigned to 1 of 2 groups. One group of 68 infants was given oxygen in routine amounts; the other group of 144 infants received curtailed amounts.

The study was set up to test not only the association between the use of oxygen and the incidence of retrolental fibroplasia but the mortality risk involved in the use of curtailed amounts of oxygen.

The preliminary results show no significant difference in the mortality of the two groups of infants receiving different amounts of oxygen. There was, however, a significantly lower incidence of retrolental fibroplasia in the infants whose oxygen was curtailed.

The conclusion drawn from this and other studies is that the use of oxygen should be restricted to amounts which are required for the survival of the infant. Although oxygen requirements of individual infants vary, present recommendations seem to be that no infant be placed in a concentration of oxygen over 40 percent.

This good news gives us every encouragement to increase our programs for prematurely born infants and our efforts to reduce the incidence of premature births and of fetal deaths.

Studies by the Chicago Board of Health emphasize the importance of the first day of life in the survival of infants. More attention to this period, a critical one for many babies, will result in greater reductions in neonatal mortality. This requires application of existing knowledge regarding the causes of death of premature infants as proved by autopsy, better prenatal care, and improved management in pregnancy and labor of mothers who have complications of pregnancy.

### Crippled Children's Services

Each of you has a major role in the State crippled children's programs, if not through administration, then through the case-finding, preventive, and followup services in your local health administration and in your maternal and child health programs.

The experiences gained through the crippled children's programs since 1936 provide an invaluable laboratory for the study of medical care administration and of long-term illness. Here are most of the ingredients of prevention and medical and social rehabilitation. Here is a program that has the strong support of public

and voluntary agencies, of private practitioners, of parents, and of the general public.

As we see how the interest in the crippled child increases and how much there is to be done, the methods we use to extend and improve these programs become increasingly important.

I am impressed by the wide varieties among the States in the proportions of the different diagnoses. In one State 38 percent of crippled children receiving physicians' services in 1 year had a diagnosis of hearing impairment. In other States which include this condition, the proportion is as low as 1 percent. The percentage of children under care because of congenital malformations varies from 44 to 6 percent. Yet, there is no reason to believe that the incidence of congenital malformations differs much from State to State.

To a very considerable degree, the crippled children's agencies are dependent on the maternal and child health programs for finding and referring the children with congenital malformations. The largest proportion of children in the programs are those who have congenital malformations of varying types, comprising 21 percent of all the children receiving physicians' services.

Most of these are recognizable early, and, therefore, your public health nurses and child health conferences are a major source of case finding and early referrals. I need hardly tell you how important early case finding is in the provision of medical care and the prevention of disability or its progression.

School health services are another major source of case finding. We have an efficient and rapid means for case finding through audiometry although most States have as yet not been able to include children with hearing impairment in their programs.

For the first few years of the crippled children's programs, virtually all the children receiving care had orthopedic diagnoses. Then, children with rheumatic fever were included, first in one State and then in another until gradually 28 States developed rheumatic fever programs.

Similarly, children with cerebral palsy, epilepsy, congenital heart diseases, hearing impairment, and other conditions have been included in many States. This has come about largely

rough the demonstration technique which public health has employed so successfully..

## Artificial Hands for Children

The Bureau has been working with the Army Prosthetic Research Laboratory of the Walter Reed Army Medical Center to see if a lifelike, functional hand comparable to the new artificial hands available for adults could be developed for children.

The first step was to contract for the production of the dies for the hand in 3 sizes: 6 years, 12 years, and adolescence. In view of the expense involved and the many problems to be explored in the use of children's hands, no single group or company could undertake the venture.

Accordingly, last spring the Michigan Crippled Children Commission with a grant of special funds from the Bureau contracted with a prosthesis company for the manufacture of dies for children's hands. An additional grant will make possible the production and delivery of functioning hands during the next fiscal year. Once one or two prosthetics companies are in production, it will then be possible for all crippled children's agencies and for voluntary organizations, hospitals, physicians, and others to order functioning artificial hands for children.

We can then study how the loss of an arm affects physical and emotional growth and development and how children can best utilize a functioning artificial hand.

The number of children receiving care in the crippled children's program is quite small, about 10,000 a year. But there are approximately 1,000,000 with orthopedic handicaps, 675,000 with rheumatic fever, 300,000 with epilepsy, 100,000-500,000 with severe hearing impairment, and many others.

We do not know to what extent all these children are getting care from private and voluntary resources, nor how adequate is the care they are getting, nor how many are going without care. Again and again, the experience in the crippled children's programs has been that when a new clinic opens or a new service starts, large numbers of children in need of care appear.

The success you have had in translating research results into organized community programs, together with the growing concern of civic groups, leads me to believe that we are on the threshold of major new developments that will bring to crippled children everywhere the medical, social, and rehabilitative services they need.

## Mental Health Services In a Program Of Public Health

# 4

By Arthur P. Noyes, M.D.  
President of the  
American Psychiatric Association

In spite of the striking reduction in certain types of illness through public health measures there remains one group of diseases in which there has been little or no reduction and which now fills approximately as many hospital beds as do all other illnesses combined. This group, as you know, is that of mental diseases.

With the increasing insights which psychiatry has brought both into the more or less serious personality disorders of the individual and into his emotional needs and their relation to mental health, this branch of medicine has in its applications tended to fall into one of two fields: clinical psychiatry and community psychiatry. This division is quite arbitrary, and the dividing line is by no means clearly drawn.

### Community Psychiatry

In this discussion, our concern is with community psychiatry, which in turn, may be divided into two aspects: one, the positive or health-promoting aspect in which one would include family as well as general community attitudes and activities that afford opportunities and influences favorable to the achievement of

satisfactory social and personal adjustment to the individual; and, two, the diagnostic and therapeutic resources which the community provides for the psychiatric needs of its citizens.

Just as public health is a relatively late development of the general science of medicine so is the first or positive aspect of community psychiatry. If the aim of public health medicine is the extension of life and an improvement in its productivity, the aim of community psychiatry may be defined as the strengthening of personality and the improvement of its adjustment.

Both public health medicine and community psychiatry should be regarded as preventive medicine. From a somatic standpoint, preventive medicine seeks the most efficient physiological functioning possible for the organism. From a psychological standpoint, it seeks the richest possible functioning of the personality.

It is desirable that the body not be exposed to the stresses that interfere with the development of a normal growth pattern.

It is equally essential that the personality not be exposed to stresses that inhibit or distort its development in its process of maturation.

From its early objectives as an agency for the control of disastrous epidemics, public health medicine evolved to a broadly based philosophy of preventive medicine for the person in all of his biological, cultural, sociological, and environmental involvements. It was logical that with such a broad objective the prevention of one of the most frequent and devastating of illnesses—mental disorders—should become a matter of great concern.

Considerably earlier, however, another medical discipline had necessarily become concerned with the treatment of mental disease. For a long time, this branch of public medicine was limited to the operation of hospitals for mental diseases and still is in many States. In others, it has also come to include in its scope the education of the public in respect to the causes and prevention of mental and behavior disorders and to some extent the operation of clinics for their treatment. Perhaps there has developed some overlapping of objectives and functions rather than an integration through one governmental department assigned a comprehensive program of education and of hospitalization.

## Somewhere Between

Why has mental hygiene, or the investigation and application of measures designed to establish and maintain mental health, become a function occupying a somewhat anomalous and divided place between two medical disciplines, each charged with public responsibility?

One discipline was originally concerned primarily with such activities as sanitation, control of communicable diseases, prevention of chronic diseases, occupational hazards, crowded living conditions, food handling, and other conditions that affect physical health.

It was gradually found that health problems were not all of mechanistic origin, that many of the problems found in the child health clinic, for example, did not have their origin in infections or malnutrition but in emotional difficulties or in interpersonal tensions. It was observed that most health problems had some related emotional component which for the establishment of most effective health must be dealt with by the techniques of mental hygiene.

It is often said that we have now reached the point in public health where further advance in the protection and improvement of the physical health of the population is beginning to require a mental health orientation. It is becoming well recognized that in its various services a health department meets a wide range of emotional problems.

The other medical discipline which rather naturally began to include mental health within its sphere of interest and activity was psychiatry. At first the establishment of asylums, largely custodial, was its principal contribution. Later as the mental hygiene movement began to gain ground, some of the superintendents began to acquaint the public with social problems created by poor mental health and to encourage the establishment of clinics for the diagnosis and treatment of milder personality and mental disorders.

Programs of mental hygiene in the States have been developed under one of two departments, either the health department or the division charged with administering the mental hospitals of the State. In some instances these two agencies are combined within a single department, along with other divisions of the

government concerned with the health and welfare of the population. Even in such a grouping, the two usually remain relatively separate in their functions.

## Some Recommendations

Personally, I believe that in the larger States, at least, the department which controls the hospitalization of mentally diseased persons should be organized as a separate department with its chief executive officer responsible to the governor. Every State, of course, should have a mental health program, a part of which has a logical place in its general health department.

However, just as a psychiatrist is not qualified either technically or by his general orientation to the subject to be the administrative head of a department of health, so too the immediate direction of a department responsible for the operation of hospitals for the treatment of actively psychotic patients can scarcely be undertaken by one who does not have a wider acquaintance with psychiatry than that now acquired in schools of public health. Not every psychiatrist, either, is adapted to mental health work in a public setting. The majority are primarily trained to do individual psychotherapy.

I doubt whether the public health clinic is the setting in which the treatment of major psychiatric illnesses should be undertaken. Many patients who receive health department services do, however, have emotional problems even though they do not give rise to the categorized clinical reactions described in the textbooks.

The anxiety of the patient seen by the public health physician does not usually arise so much from the threat of weakening repressions as from some very realistic situation connected with the circumstance that brought him to the clinic. The anxiety felt by the breadwinner of the family who learned from a mass survey that he has pulmonary tuberculosis is not the anxiety felt by a compulsive neurotic.

Such anxieties are not treated by deep analysis but through the team therapy of the public health nurse, social worker, and the mental health-minded physician. In such a situation there is no place for the isolative tendency of the usual clinical psychiatrist.

But let us turn to the problem of mental health as it is associated with the activities of a State, city, or community health department, in which there should be a special division concerned with mental health. The time has come when public health should have a better understanding of cultural patterns of the community, of the inner feeling states which the public health worker will inevitably meet.

It seems to me that the schools of public health are not yet including sufficient psychiatry in their courses to prepare their graduates adequately for the directorship of a mental health division even though its emphasis will be on mental health rather than on mental disease, on prophylaxis rather than on therapy.

Public health personnel should be taught that many problems not previously considered as in the field of mental hygiene really belong in that sphere, that mental health and other services in a health department should be more closely integrated. There has been too great a tendency to separate psychiatric problems from their original context, a tendency which psychiatrists have unwittingly but frequently encouraged.

It is essential that the liaison between the mental health and the other divisions in the health department be quite close and that there not be the self-contained autonomy so often existing in bureaus. It would be highly desirable for the chief of a psychiatric division in a health department to have had some training in the social sciences, and to be aware of how people think and feel, of how they live within the social institutions and cultural patterns of the community.

## Part of the General Health Program

What department should be responsible for the clinic which serves the ambulant mentally ill, the psychoneurotic and the psychosomatic patients? What department should direct such child guidance clinics as are not operated by privately endowed agencies?

All these clinics are primarily treatment in function and should be operated by the department that directs the administration of the mental hospitals, the department that I suggested be administered separately from the health department.

What, then, should be the function of the health department in respect to mental health? This should be preventive. There would be the greatest opportunity for reaching people who most need help and education in mental health matters if a mental hygiene service were integrated into the general health program of the local health officer. In practice, there is a great difference among the States as to the division of the mental functions and activities of a department of public health and those of a department of mental health.

Both types of departments have expanded their activities in recent years, yet there has been a tendency for health departments to be increasingly attentive to prophylactic and public education activities, while departments responsible for the administration of hospitals have increased clinical facilities for mentally ill or maladjusted persons.

Mental disease is one of the largest and most serious of health problems which may be approached by the usual methods of public health—emphasis on education, prevention, early case finding, and prompt treatment. These are the tenets that run all through the working principles of public health.

There is another and in many respects a wider view from which the subject of mental health should be approached. The need and demand for mental health services have become increasingly recognized, yet are so inadequately met and so poorly organized that there is need for comprehensive community programs to be established through local or State legislation.

### One State's Findings

I will take the liberty to call attention to some of the conclusions reached by the New York State Mental Health Commission following its survey of the programs for mental health services throughout New York State.

The commission found that nowhere in the State were there adequate mental health services at the community level. Except for a few localities mental hygiene clinics were the only mental health service. At the local level there was no single governmental agency charged with the responsibility for community mental health. In some communities parts of the mental health

program were provided by health departments, education authorities, welfare officials, and by courts, but nowhere was there a central planning body for mental health services. As a result there was overlapping, duplication, and gaps in service, and overextension of their programs by some agencies.

The commission found that at the local level there tended to be fragmentation of services by reason of the fact that financial support, although limited, was available from a number of State departments and agencies.

The commission concluded that mental health services develop best in relation to needs when they are the responsibility of local government even though State financial aid and professional consultation might be necessary. As would be expected, it was found that mental health services have been developed by a variety of public agencies and by a large number of voluntary organizations.

The commission did not recommend the giving up of any existing qualified service. It was of the opinion that comprehensive programming for community mental health requires the combined efforts of health, welfare, education, judicial, and correction agencies, both public and private. It urged coordination and integration by a single, responsible agency of local government.

In reviewing community mental health services, the commission expressed the opinion that no community has a complete program if it does not have these five types of service:

The mental hygiene and child guidance clinics, inpatient psychiatric services in general hospitals, and the case-finding efforts of school systems, welfare agencies, and public health departments.

Rehabilitation services for the discharged or convalescent patient from the mental hospital.

The consultative services provided by trained mental health personnel to the professional staffs of other agencies, such as courts, schools, and welfare departments.

The educational activities carried out by mental health personnel, designed to inform other professions and the general public what has been learned from the clinical relationships

mental health personnel regarding the problems of human personality.

Specific efforts to deal with facts of community life in such a way as to reduce the frequency with which personality disorders occur. Other States will watch with much interest as attempt to secure complete and integrated mental health services.

## Research in Program Methods and Evaluation New York State

By Herman E. Hilleboe, M.D., M.P.H.  
Commissioner of Health  
and George James, M.D., M.P.H.  
Assistant Commissioner for  
Program Development and Evaluation

The New York State Department of Health created a new unit in 1952 to assist the commissioner in evaluating the results of program activities and in promoting the development of new public health programs.

The new office is working toward the development of yardsticks for measurement of public health performance and is exploring methods for the determination of health need and accomplishment. It has stimulated local research throughout the State, in the belief that the future of public health activity in this area of changing priorities will be determined largely by patterns developed through local health activities.

The office of program development and evaluation consists of an assistant commissioner, a cultural anthropologist experienced in public health, a biostatistician, and, on occasion, an administrative officer. In addition to having full responsibility for statistical services, the director of the office also maintains technical supervision and general communication with all development, evaluation, and research activity in the department.

A few examples will illustrate the scope of this special team's accomplishments.

### In Heart Disease and Hypertension

The new office has studied the entire problem of adult heart disease, looking for the best possible public health approach, and with a view to developing a program which would utilize tests for the mass detection and followup of both clinical and preclinical coronary heart disease and hypertension.

Projects of similar nature were visited; the literature was combed, and numerous consultants were asked for suggestions.

The Albany Cardiovascular Health Center project resulted. The center was devised to:

Detect and follow coronary heart disease and hypertension, determining the incidence, prevalence, and progress of these diseases among the participant group—2,000 male State employees in Albany between ages 40 and 54.

Determine the validity, reliability, and efficiency of the various techniques in the detection of these heart diseases during their preclinical or earliest clinical stage.

Develop and evaluate methods of applying these detection tests to large groups of the population.

Develop and maintain research teams which will perform satellite studies around the core testing program.

Offer an excellent periodic cardiovascular diagnostic service to 2,000 susceptible men, sending all pertinent data to each member's physician.

Stimulate and develop the interest of all State health workers in heart disease problems and programs.

Evidence has already been turned up that the history of cardiac symptoms elicited by the physician and the measurement of heart size by electrocardiogram and physical examination are both seriously lacking in reliability.

When the yardsticks for diagnosing and detecting heart disease are thus at fault, perhaps our major attention should be toward improving their scientific accuracy and consistency before further developing their practical application.

Six studies in the general field of heart dis-



ease have already been started, and many more are planned.

## In Radiological Health

The protection of the public against dangerous radiation clearly concerns every health department. Radiation may come from naturally occurring radiation elements, X-ray machines, or materials that have been made radioactive by nuclear reactors. Because the use of radiation is increasing, a special problem faces the health officer.

The program development and evaluation unit is studying this problem. Special laboratory and survey equipment has been provided; a promising young sanitary engineer specially trained in radiological health has been appointed, and a technical advisory committee of radiation experts has been named. Existing knowledge on the need for a radiation control program was compiled, and a sanitary code regulation of great scope was recently passed.

An earlier regulation established standards for the 400 shoe-fitting fluoroscopes in upstate New York. This work in ionizing radiation control permitted the field engineers to gain technical knowledge which will be valuable in the more complete program now under way.

Special courses in radiation control are to be held for physicians. The sanitary engineers have already been given intensive training programs in both the field and the classroom.

## In a Tuberculosis Program

A special team of well-trained public health people who are not personally identified with the tuberculosis program can often help us in taking a critical look at accomplishments and the yardsticks used to measure them. The new unit has surveyed the accomplishments in tuberculosis since New York's expanded control program began in 1947.

Among the interesting findings were:

The development of special yardsticks for the evaluation of case-finding services.

The clearcut delineation of areas with poor tuberculosis case-finding activities.

The decreasing yield of active tuberculosis found on the mass survey, by X-ray of adult

admissions to general hospitals, and among persons attending chest clinics.

The approximate cost per case of tuberculosis found by various procedures.

The proportion of those screened who are found to have various pathological conditions on followup.

The dramatic decrease in incidence and prevalence of tuberculosis at State mental hygiene institutions and the reasons why it is believed that this decrease is due to the department's efforts.

The great decrease in the number of patients reported as having "tuberculosis—stage undetermined."

The unchanging proportion of cases discovered from death certificates.

The importance of a new plan and studies governing the proper use of State and local tuberculosis hospitals and drug therapy for control of this disease.

## In Cause-of-Death Reporting

The literature is filled with statistics based upon causes of death listed on death certificates. The new unit took a critical look at the accuracy and value of these statistics in New York State. By comparisons of autopsy and original death certificates on file, it discovered that while overall death rates might change little because of compensating factors of error, these compensating mechanisms cannot be expected to extend to the other factors associated with the death.

Hence, if these statistics are used as bases for epidemiological studies of what type of person dies from cancer, heart disease, or cerebral hemorrhage, for example, the use of cause-of-death data should first be refined. Also, multiple causes of death must be considered.

Perhaps our most promising point of attack against a chronic disease may lie in the correction of a condition which is not now listed on the death certificate. A simple example of this is the possible effect of obesity control on preventing death from hypertension.

The program and evaluation office has suggested that local health units use special pilot projects in searching out a new approach to the collection, tabulation, and use of cause-of-



th statistics for the assessment of chronic ease needs, programs, and accomplishments.

## a Traffic Accident Study

Many agencies have studied the high annual of accidents on the highways, but few have the work along epidemiological lines. Insufficient data are available on the characteristics of the population having a particular risk of highway accident. Some studies by the New York State Public Works Department have pointed out that drivers cannot be divided into those who drive fast or slowly. Rather it has been discovered that almost all drive over the speed limit 15 percent of the time.

The epidemiological problem, therefore, is not a matter of search for situations which are like any individual accident prone at a particular time. Such study requires careful attention to social science interview and survey techniques.

The evaluation team devised a special interview questionnaire which was applied to area probability samples in two small cities. Many factors were studied which might be associated with the occurrence or nonoccurrence of a motor vehicle accident.

In another project planned, observations will be made of driver behavior, and interviews will be conducted both on an area probability basis and also on specific individuals observed doing hazardous or nonhazardous activities relating to driving.

## Fiscal Research

Recognizing that for most essential services the cost of public health programs and research will continue to increase and that the money available for these services is reaching its limit, the State department of health, in cooperation with a temporary legislative commission, undertook to study accounting and budget concepts that would be useful in controlling costs and that would provide administrators with a more effective tool for the measurement of alternative courses of action, the evaluation of performance, the development of priorities, and an understanding of the true costs of specific programs.

A State tuberculosis hospital was selected for this. The specific principles or concepts tested were the accumulation of cost by program, function, or area responsibility; the separation of costs into variable and fixed components; the relation of variable cost to workload for the use of standards for planning activities and appraising performance.

It is important to realize that costs alone can never be controlled, for it is the individual who makes the administrative decisions that result in costs. With complete information about the costs of all alternatives to a decision, the top administrator has sufficient fiscal data at his disposal to supervise the person making a decision with a cost implication.

Costs are also expressed in terms of workload, thus permitting public health administrators and others concerned to have a more concrete idea of what specific State appropriations are being used to accomplish an objective.

An important feature of this new system is its value to the health officer in the development of his long-range plans. If he knows the cost of each of several alternate plans, he will be able to adjust his program more readily to the funds allocated by the appropriating body.

# Outpatient Management And the New Drugs For Tuberculosis Control

# 6

By Robert J. Anderson, M.D.  
Assistant Chief  
Division of Special Health Services  
Public Health Service

New drug therapy for tuberculosis has raised many questions about tuberculosis control. You are all aware of the dramatic reduction in tuberculosis mortality in tuberculosis hospitals through the use of streptomycin, para-aminosalicylic acid, and isoniazid. At this stage,

however, we should take care lest the spectacular performance of these drugs lead to undue reliance on outpatient therapy in dealing with a disease that still requires hospital management to a major degree.

It seems that isoniazid and para-aminosalicylic acid are for the present the first drug approach. Streptomycin may be held in reserve to cope with treatment failure and drug-resistant organisms.

Studies done by the Public Health Service and cooperating sanatoriums show that the maximum effect on making patient's sputum negative is obtained by not less than 16 weeks of therapy. Beyond 16 weeks of treatment, few of the remaining positive patients become negative, even under continued therapy. This is important in planning isolation of the patient. The momentum of X-ray improvement still continues after 32 weeks of treatment. Long continued drug therapy seems to be indicated, but exactly how long no one knows. Para-aminosalicylic acid is, if anything, a slightly better partner for isoniazid than is streptomycin.

The older the patient is, the longer he has had his disease, the less likely is a favorable treatment result. These observations emphasize the importance of early case finding to achieve maximum effective treatment and to reduce the proportion of patients who arrive at a chronic stalemate in their struggle with their disease.

On the hypothesis that isoniazid may possess prophylactic qualities, the Public Health Service now is undertaking an extensive study to determine the possible value of the drug in preventing complications of primary tuberculosis in children, particularly tuberculous meningitis.

### Importance of Case Finding

Plans are now going forward to coordinate the study in pediatric centers throughout the United States and Puerto Rico. Patients selected for this investigation will be treated under a uniform protocol. The results will be assessed centrally by the physicians working in these centers. Possibly the future will see the extension of drug prophylaxis to the prevention

of tuberculous infection in a tuberculous environment.

It has been observed that when the patient's sputum persists bacteriologically positive, in spite of drug treatment, some of the bacilli remaining demonstrate a resistance to that drug. Isoniazid-resistant tubercle bacilli are virulent for some animals and avirulent for others. We do not yet know that the patient who is sputum-positive with some drug-resistant organisms after drug therapy does not spread disease to other humans. This is a challenging subject for an epidemiological investigation of significance to the future practice of tuberculosis control.

Case-finding activities continue in importance in the control of the disease. Not so long ago case finding was held back because no treatment was available for the cases discovered. Now, is it not logical, as treatment becomes more effective, more available, and less costly, that we devote more of our resources to this and the other activities in control?

### Changes in Hospital Practice

The effectiveness of the drugs has changed hospital practice, both in therapeutics and in medical administration. Within the hospital there are shifts occurring in the use of such techniques as pneumotherapy, thoracoplasty, and pulmonary resection.

The duration of patient stay is being effected, for patients either obtain maximum hospital benefit earlier or are saved from what previously were progressive and fatal disease processes.

Studies of hospital phenomena are needed to show the exact changes occurring in the way hospitals are playing their role. Earlier discharges are vacating tuberculosis hospital beds. These may remain unfilled to the extent that the rate of discharges exceeds the development of new cases, that outpatient diagnosis and treatment are substituted for hospitalization, and that patients with other medical or surgical problems of the lungs and chest, or with other chronic diseases, are permitted or refused admission.

For practical purposes newly reported cases

are a useful measurement of the incidence of tuberculosis disease. In 1953 the States and Territories reported 113,531 cases of tuberculosis, a decline of only 3.5 percent from 1952. This 3.5 percent reduction in new cases does not keep many tuberculosis beds vacant.

## Outpatient Management

Streptomycin, para-aminosalicylic acid, and isoniazid are effective, cheap, and easily administered, leading to an extension of therapy beyond the hospital.

There are several circumstances under which outpatient drug treatment is employed. One, the common practice of continuing treatment after early hospital discharge, seems consistent with the knowledge we possess of the effects of the drugs on sputum status and clinical improvement.

Another circumstance which leads to outpatient treatment was a marked insufficiency of tuberculosis hospital beds for the patients. In the pre-drug era we put patients in waiting lists until we could hospitalize them. Now we put them on drugs.

Long continuous therapy is more uncertain out of the hospital: Patients do not like the routine of taking pills daily, do not tolerate nausea, dislike being jabbed with needles for twice-weekly streptomycin injections. Nevertheless, some improve.

Should I ask you, then, to believe that outpatient therapy, without rest (some patients continue to work), without proper diet, without surgery when necessary, will produce an equal result to hospital management?

Also, an increase in outpatient treatment results when physicians retain their patients instead of referring them to available beds in hospitals and health departments as in the past. For its effect on public health practice, outpatient treatment under this circumstance must be evaluated not alone in terms of patient survival, patient recovery, patient relapse as compared with hospital care data, but also in terms of case reporting, continued case supervision, patient education, contact examination and supervision, sputum conversion rates, and infection rates.

Although we need to define the role of outpatient treatment, for the time being, for the welfare of tuberculosis patients and their families, it is incumbent on us to emphasize the advantages of hospitalization for prompt recovery and the protection of the family.

When a tuberculosis patient is to be an outpatient, the health department should see that he has:

A home environment that will be conducive to optimum therapy, including satisfactory provision for protection of family and neighbors.

Adequate nutrition as demanded by a therapeutic regimen.

Necessary assistance for the family, with direct reference to their financial, social, and psychological needs.

Adequate bedside nursing.

Proper diagnostic treatment and followup services, including radiological and laboratory examinations.

Health education for both patient and family, as a means of maintaining the high level of community protection which institutional care normally affords.

Finally, the drugs themselves, in adequate supply to maintain optimum therapeutic levels.

## Preliminary Observations

The Public Health Service has recently undertaken a study of the characteristics of non-hospitalized tuberculosis patients, the kinds of services they are receiving, and how they appear to be faring.

Here are some preliminary, rough observations:

Approximately half of the known active tuberculosis cases are hospitalized, and one-half are at home. Of those at home, two-fifths have drug therapy recommended, and the remainder are at home with no recommendations known to the health department for drug therapy.

Health departments find it difficult to determine which of the known cases at home are active. Preliminary tabulations show that on the average 20 to 35 percent of the known active cases at home have not had a clinical examination or X-ray within the preceding 12 months. A similar proportion have not had a determination of their bacteriological status. Even

though rest and restriction of activity is still considered an essential part of the treatment for tuberculosis, approximately half of the cases at home were not given any specific recommendations in this regard.

These preliminary tabulations indicate that there are very marked variations in the adequacy of care that patients are receiving at home, and that many of them are getting no more home care than in the pre-drug era.

You might say that although the drugs are spectacular there is still no evidence that they can do for tuberculosis what penicillin has done for syphilis. Many cases still need this combination of preliminary hospitalization, surgery, and laboratory control. The drugs should not make us less active in finding cases, keeping patients and their contacts under public health supervision, and educating the public about tuberculosis.

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# Infectious Hepatitis, 1953 and 1954

Infectious hepatitis was added in 1952 to the list of diseases to be reported weekly, but notification was known to be incomplete for that year. During the following 2 years reporting was much improved and was probably better in 1954 than in 1953.

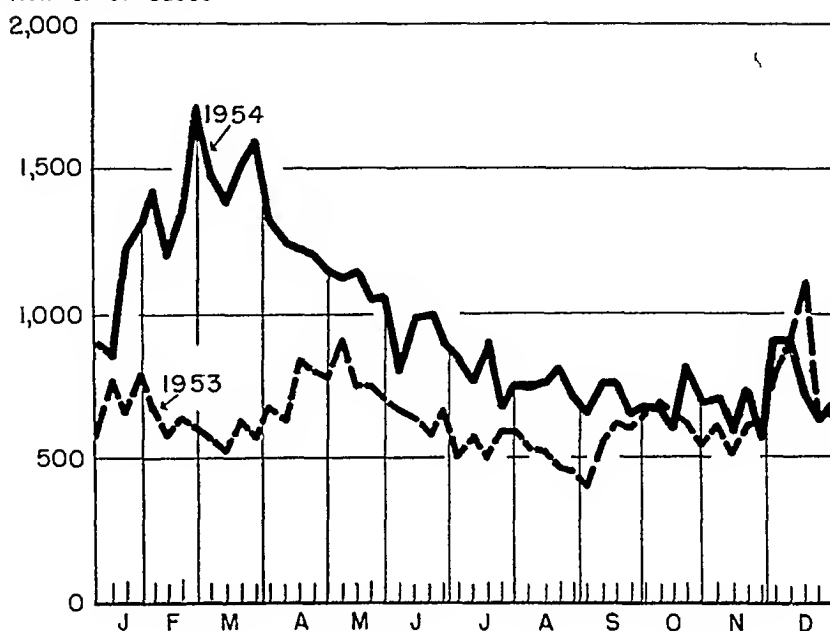
A high incidence of the disease occurred during the late winter and early spring months of 1954. For the corresponding period in 1953, the chart shows a bimodal distribution which probably reflects reporting procedures rather than an actual seasonal trend. Although incompletely reported, the 1952 figures indicate a definite peak in February, as in 1954.

The incidence decreases during the summer months and may reach a low point sometime during the fall months. Sufficient data are not available at this time to establish the season of lowest incidence.

The provisional number of cases reported in 1954 is 49,739 compared with 33,382 for 1953. The large number of cases reported during these 2 years indicate that the disease is a major health problem. This is particularly true in certain areas of the United States. More than a third of the cases for both years were reported from the Middle Atlantic and South Atlantic States. A large number of cases were also reported in the West North Central States, especially during 1954.

*This material was prepared by Granville Sylvester and Dr. C. C. Dauer of the National Office of Vital Statistics, Public Health Service.*

Number of cases



Infectious hepatitis in the United States, by week: 1953 and 1954.

During 1953 and 1954 approximately 60 reports of epidemiological investigations of outbreaks of infectious hepatitis were received by the Public Health Service. These reports accounted for less than 3,000 of the total cases reported.

Many cases were not considered associated with outbreaks, and reports of outbreaks were not received from many States. Some States probably did not report outbreaks because the cases usually occur over a period of several months as the incubation period of the disease is from 15 to 35 days.

The mode of spread for most of the outbreaks was given as personal contact. Food, milk, and water have been considered a vehicle of infection, but in only four instances during 1953 and

1954 was water considered as a possible vehicle. Food and milk were not suspected as vehicles in any of the reported outbreaks, which occurred most often among institutional or school populations. In several instances the disease was associated with unsanitary living conditions and was among persons in the low socioeconomic group.

An unusual characteristic of the disease is the long period, 6 weeks to 2 months, of convalescence from the infection. No successful treatment has been found, and in some cases the infection leaves chronic liver damage. Gamma globulin has been used successfully for prophylaxis. It gives passive immunization and is effective if given to contacts during the early part of the incubation period.

*To summarize in systematic order the reports of progress in arteriosclerosis research supported by grants of the Public Health Service, Dr. Murray Goldstein prepared for the National Advisory Heart Council and for limited distribution a detailed and documented account of the studies and their relation to the pathogenesis, treatment, and prevention of this disease. Dr. Goldstein is an assistant to the chief, Grants and Training Branch, National Heart Institute, Public Health Service.*

*The following paper, drawn from the original report, aims to call attention to the general scope of*

*the research, rather than to evaluate individual findings or to describe them in precise detail. At this stage, with so much still unknown and with many studies still in progress, it is not possible to establish an accurate perspective. Also, this paper excludes much valuable work that is unpublished or is supported by institutions other than the Public Health Service. Compressing the information and arranging it in this context has inevitably resulted in somewhat arbitrary statements and has perhaps strained the intended meaning of the reports by the scientists.*

# Arteriosclerosis Studies

**R**ESearch in cardiovascular health is a prime function of the National Heart Institute, a division of the Public Health Service. Since its founding in 1948, in addition to conducting research in Government laboratories, the institute has granted more than \$3.5 million to universities and other institutions to support research related to studies of arteriosclerosis. Most of this amount applies to studies which are still in progress.

The pattern of this research is determined largely by the applicants for grants. The scientists themselves pose the questions which must be answered in advance of further progress in the field.

## Definition and Classification

Relatively few grants have been sought for defining the entity of arteriosclerosis, that condition marked by loss of elasticity, thickening or hardening of the arteries, or atherosclerosis, a specific type of arteriosclerosis characterized by lipoidal and plaque-like changes in the innermost layer of the artery, the intima. One definitive project classifies an entity known as coronary

heart disease, from studies of heart muscle lesions. Correlated clinical findings and electrocardiograms are offered to support this diagnosis.

## Experimental Studies in Pathogenesis

The need to develop experimental techniques is both primary and chronic in the search for contributing factors in arteriosclerosis. The successful use of animals to induce sclerotic processes comparable to those in man began with Anitschkow's work with rabbits in 1908. Since then, experimental studies have employed guinea pigs, rats, dogs, cockerels, chickens, rabbits, and Cebus monkeys. Work supported by the Public Health Service has produced many basic contributions to experimental techniques, involving control of diet, administration of chemicals, action of hormones, transfusion of serums, physical injury, genetic influences, and the effects accompanying aging.

An early need in experimental techniques was to develop simple and reliable methods of inducing the process of arteriosclerosis. Cholesterol, a lipid found in animal fats and oils,

whole milk, egg yolk, liver, and certain forms of seafood, was associated with the sclerotic process by Anitschkow. Since diets high in cholesterol do not invariably produce the condition, other contributing forces have been looked for. Low thyroid activity is one. Arteriosclerosis develops in dogs fed a high cholesterol diet supplemented by thiouracil, a chemical which reduces the production of thyroid hormones. The thiouracil does not so affect dogs on a normal diet.

Readings of cholesterol in the serum of dogs are used in efforts to predict the severity of arteriosclerosis. The injury regresses if the serum cholesterol falls below a certain level. Once the necessary fatty state in serum is established, arteriosclerosis may develop in a matter of days or even hours.

Instead of using thiouracil or thyroidectomy to induce arteriosclerosis in dogs, a laboratory may save time and effort by using radioactive iodine to depress thyroid activity. Curiously enough, the loss of thyroid activity resulting from surgery, followed by an associated rise of cholesterol in the blood, does not produce coronary atherosclerosis in patients with a history of cor pulmonale, a heart disease secondary to disease of the lungs, or rheumatic heart disease.

A process for inducing atherosclerosis for experimental study, without prolonged cholesterol feeding, consists of planting diethylstilbestrol, a synthetic chemical with action resembling a female sex hormone, under the skin of a chicken. This chemical produces a sustained condition of excess lipid in the serum of chickens and, consequently, arterial lesions which closely resemble those found under controlled conditions.

Rats resist efforts to induce arteriosclerosis even when diabetic, although it is common to find atherosclerosis associated with diabetes in humans. On spectral analysis, the fatty proteins in rat serum differ from those of other experimental animals. Rats, which fail to develop a high level of cholesterol in the blood on a fatty diet, rapidly develop such a condition on the identical diet when rabbit serum is transfused into them. This experience suggests that the difference between rat and rabbit plasma may be the basis for the difference in susceptibility of these species to arteriosclerosis.

A study of the relation between physical in-

jury to the artery wall and the formation of atheromatous plaques finds that weanling albino rats are remarkably resistant to the consequences of injury induced by injection of sodium acetylsulfathiazole. The severity of the consequent lesions increases with the age of the rats injured. Injury to the artery wall of rabbits subsequently fed a high cholesterol diet produces a lesion similar to human arteriosclerosis. Of associated interest, microscopic studies reveal hemorrhage within the artery wall in sudden human deaths from coronary artery disease and coronary atheromatosis.

### Fundamental Studies

The driving forces in the arteriosclerotic process may be in the fluids surrounding the artery wall, in the behavior of the cells of the wall itself, in various forces of environment or custom, in genetic influence, or in a combination of several conditions.

#### *The Artery Wall*

Studies of the cellular metabolism of the artery wall itself have been stimulated by the realization that atherosclerosis may occur without the appearance of excess fat in the plasma. One such study demonstrates that the rat artery may convert acetate into fatty acids and can incorporate phosphorus into the phospholipid molecule. The artery wall itself thus can contribute to the production of lipids. To facilitate similar studies, an investigator has developed a technique for measuring the metabolism of intact arterial tissue under aseptic conditions.

Some spontaneous coronary artery lesions of birds are found to be fibrotic rather than fatty; fats may have a late part even in the forming of arteriosclerotic plaques in the aorta of old dogs. Another investigation finds that mucopolysaccharide deposits occur before the lipids. These studies are associated with other efforts to work out the precise cellular history of what appears to be a proliferative and degenerative disease.

The aging factor in the arteries has been associated with the formation of bone or cartilage in the aorta of senile rabbits. Calcification of the media, another sign of aging, is said to precede the formation of intimal plaques, although this

conclusion is not supported by other studies. Autopsies demonstrate that arteriosclerosis increases with age in both sexes. It is more severe, however, in the male. The relatively greater susceptibility in boys appears before their 10th year.

Still other techniques are being developed to pursue the study of the role of the arteries in the hardening process.

### *The Artery's Surroundings*

Studies of the artery's chemical and physical environment deal with three main fields: cholesterol and phospholipids; lipoproteins; and physical forces, including blood stream pressure and turbulence.

The presence of cholesterol and its esters in diets, in plasma, and in arterial plaques associated with arteriosclerosis has commanded particular attention.

The work of identifying, measuring, and exploring the metabolic processing of these lipids deals with the production and destruction of cholesterol, the differentiation between cholesterol taken in the diet and that formed by the body, and the activity of "trace companions" of cholesterol as atherosclerotic agents.

The fate of cholesterol in the intestine is affected by certain micro-organisms and by chemical conditions which may prevent or accelerate its absorption into the blood stream.

The liver is the chief organ for removing excess cholesterol from the blood. It excretes 60 percent of the excess as bile acid. When unknown forces prevent the return of plasma cholesterol to the liver cells, an excess of fat appears in the blood.

Young animals appear to form more cholesterol in the liver than their elders. Low calorie diets reduce the rate of such formation; high calorie diets restore it. The rate is depressed by a high fat diet, which also seems more effective than a low fat diet in removing cholesterol accumulated in the liver of rats. A high level of cholesterol in the blood does not appear in dogs with deficiency of magnesium or in the liver of rats with a deficiency of pantothenic acid. A deficiency of pyridoxine is accompanied by a high level of cholesterol in the blood of Cebus monkeys and rats, but not in rabbits. Even with a calorie deficiency, chicks on a high

cholesterol diet have excess cholesterol in the blood and develop atherosclerosis. As calorie intake rises, successive increments of blood cholesterol decrease. Other dietary fats in combination with cholesterol appear to induce higher fat and cholesterol levels in human blood than cholesterol alone.

Detergents, which have a wetting action that keeps fats and oils in suspension so that they do not cling to affected surfaces, increase all blood lipid components, especially phospholipids. An increase in phospholipids appears to retard or prevent atherosclerosis. The ratio of blood cholesterol to blood phospholipid (C/P ratio) may be of importance in retarding atherosclerosis.

Two substances found in the blood stream, known as lipofanogen and antilipofanogen, respectively, support or oppose the forming of visible fat granules in tissue culture. As cholesterol combines with antilipofanogen, the opportunity for lipofanogen to create fat is enhanced.

Obstruction of the bile duct has been associated with high cholesterol levels in the blood. On the assumption that these levels are supported by the action of retained bile salts, it was discovered that cholate impedes the transfer of cholesterol from plasma to liver. High blood cholesterol may be a development secondary to disorder of cholate metabolism.

In addition to occupation, housing, and dietary patterns, genetic factors may be significant in the tendency to form cholesterol.

Cholesterol and phospholipids in blood exist in combination with proteins rather than in a free state. Such combinations are known as lipoproteins. The amount of lipids in such proteins is measurable by a flotation process which permits analysis according to the density of various classes of lipoproteins in plasma. These are classified in terms of Svedberg flotation (Sf) units. Four laboratories engaged in such investigations are participating in a cooperative study on lipoproteins and atherosclerosis.

Efforts to measure the volume and forms of lipoproteins in the blood and in fixed tissues are proceeding with the prospect that these measurements may help to predict the imminence of atherosclerotic change, to diagnose the present degree of atherosclerosis, and to guide the management of the condition and its consequences.



If it is determined what classes of lipoproteins are most formidable, preventive or therapeutic measures may follow.

Because the level of serum cholesterol and lipoprotein has been found to vary in men over a 10-week period or more, single readings may not serve as a reliable indication of a patient's condition.

The liver, one of the organs which produce lipoproteins, increases its output of certain classes if it is chronically inflamed or if it is poisoned by carbon tetrachloride. Hepatectomy causes a gradual decline in all lipoproteins.

Animal species vary in their typical patterns of lipoproteins and in their susceptibility to the effects of different lipoprotein classes. Young women have more alpha lipoprotein fractions (associated with alpha globulin) and fewer beta fractions than young men. Many men and older women tend to have lower levels of albumin and alpha lipoproteins and relatively higher levels of beta lipoproteins than young women. (This information correlates with the greater tendency of men and older women to develop atherosclerosis.) The same tendency appears in patients with clinical signs of atherosclerosis, as well as among persons with diabetes, nephritis, and xanthomatosis, even when their cholesterol or C/P ratio is not elevated. The level of Sf 12-20 beta lipoproteins is higher in persons with diabetes if they are also arteriosclerotic. The concentration of such lipoproteins has been reported to be a more accurate indicator of atherosclerosis than the cholesterol level. In some circumstances, it is this lipoprotein factor which links obesity with atherosclerosis.

Effects of heparin, a normal trace constituent of the blood, are undergoing extensive study in the search for a chemical which may influence the formation of arteriosclerosis.

Physical forces examined in relation to arteriosclerosis include surface tension (detergent action), filtration of fats by artery and capillary walls, turbulence of blood in the aorta of rabbits, and elevated blood pressure (hypertension). Although hypertensive patients show a high incidence of arteriosclerosis, the experimental evidence so far does not establish that the one condition necessarily induces the other.

## Clinical Studies

There have been no research projects on the incidence of morbidity from arteriosclerosis because of the difficulties of reliable diagnosis.

A reliable method by which the incidence or severity of arteriosclerosis could be measured objectively has been the goal of many investigations. Determinations of serum cholesterol, cholesterol tolerance, lipoprotein fractions, phospholipids, cholesterol-phospholipid ratio, lipofanogen-antilipofanogen ratio, or neutral fat have been suggested as possible indexes of the probability of developing or having already developed arteriosclerosis.

In man, excluding histological study after biopsy or necropsy, the only reliable method of diagnosis at the present time depends on the onset of symptoms associated with a decreased blood supply to specific organs or parts of the body. For better objective evaluation of these observations, many methods and devices have been suggested and are being perfected; some of these are flicker flame photometry, plethysmography, ergometry, electrocardiography, vector cardiography, ballistocardiography, vascular catheterization, roentgenography, and angiography. As yet, no generally acceptable means has been agreed upon for the preclinical diagnosis of arteriosclerosis.

## Prophylaxis and Therapy

Diet, medication, surgery, and rehabilitation are being studied as means of preventing or treating arteriosclerosis.

The administration of adrenal cortical and corticotrophic hormones is associated with high levels of cholesterol and lipids in the serum without an increase in lipoproteins or in atherosclerosis.

The relative susceptibility of males to arteriosclerosis has encouraged studies of the effects of synthetic and natural sex hormones on the occurrence and treatment of this disease.

Studies of thyroid effects find that administration of thiouracil or thyroidectomy does not cause regression of arteriosclerotic lesions in dogs.

After biological experiments indicated that

a portion of the mammalian brain affects the movement of cholesterol into the blood stream, a lipid-poor, cholesterol-free residue of this organ was fed to patients with arteriosclerotic heart disease and a high level of cholesterol in the blood. Their serum cholesterol fell "significantly," presumably as a result of the chemical effect blocking the absorption of sterols in the intestine.

Common "lipotropic agents" necessary for fat metabolism, such as choline, methionine, and inositol, have no beneficial effects on the incidence or severity of arteriosclerosis. Ferric chloride decreases absorption of cholesterol from the alimentary canal but not its production by the liver. Other chemicals which reduce absorption are sitosterol and dihydrocholesterol.

The prospect of prophylaxis by diet is not materially brightened by studies to date. A decline in Sf 12-100 lipoproteins accompanies a loss of weight. The Kempner rice diet reduces serum cholesterol and the C/P ratio. It is not certain that restriction of cholesterol in the diet will ordinarily reach the level needed to produce clinical results. The amount of cholesterol in the diet may vary widely without

producing marked effects on the levels in the blood. Restriction of cholesterol in the diet must be accompanied by considerations of total nutritional needs, such as the part proteins play in lipid metabolism.

Surgery to repair or replace vessels damaged by arteriosclerosis has employed a variety of techniques. These include generation of inter-coronary vessels in a heart inflamed by abrasive asbestos powder; grafting of substitute arteries which have been dehydrated or taken out of cold storage; the use of prosthetics made of metal, plastic, latex, or thorotrast; and the patching of arterial walls with peritoneum. The technique of grafting has evoked studies of optimal length, source, structure, sterilization, and storage of blood vessels.

Studies of rehabilitation of cardiac patients are actively encouraged. Energy requirements, as measured by oxygen consumption, are being measured for various occupational activities.

Most of the clinical studies noted here are undertaken in association with experimental laboratory studies, in order to assure that the patient will have the advantage of validated theories, technical experience, and full understanding of the biochemical factors.

## PHS films

### Arthropods of Public Health Importance

35 mm. filmstrip, sound, color, 7 minutes, 42 frames. 1954.

Audience: Entomologists, parasitologists, sanitarians, and students interested in arthropods.

Available: Loan—Public Health Service, Communicable Disease Center, 50 7th St., NE, Atlanta 5, Ga. Purchase—United World Films, Inc., 1445 Park Ave., New York 29, N. Y.

Arthropods of public health significance are featured in this filmstrip.



*Rhodnius prolixus*, a kissing bug

It shows the outstanding characteristics of some of the more common insects and in a few instances gives the life cycle of one or more species of a particular arthropod. Included

are: cockroaches, mosquitoes, flies, bedbugs, *Triatoma*, fleas, lice, scorpions, tarantulas, spiders, centipedes, ticks, and mites.



*Centruroides*, a poisonous scorpion from Arizona.

## Legal Note

on public health

## Court Acceptance of Delayed Birth Certificate Filed by Court Order

The recording of a birth certificate was held by the Federal District Court, in the case of *United States v. Casares-Moreno*, 122 F. Supp. 375 (S. D. Cal. 1954), to be only prima facie evidence of its validity, even though it was filed pursuant to an order of the Superior Court of Los Angeles County, and was subject to rebuttal.

The defendant, on trial as an alien who attempted to enter the United States after his deportation, produced a public birth certificate, filed with the California registrar under delayed filing procedures, showing that his parents had given birth to a son in the United States. The birth certificate indicated on its face that it was offered for filing pursuant to order on August 13, 1936, of the Superior Court of Los Angeles County.

The prosecutor, in rebuttal, contended that the son born in the United States was not the defendant but his brother and that the defendant had taken the name and identity of the brother.

The jury found that the defendant was not born in this country.

The defendant did not contest the court's proposition that ordinarily an instrument which the law required to be recorded is only prima facie evidence of the validity of the instrument. He did contend that since the birth certificate in question was recorded pursuant to an order of the superior court it thereby gained some higher status and became a judgment which under the full faith and credit clause of the Constitution had to be treated as a conclusive adjudication of facts stated therein.

The Federal District Court rejected this contention on the following grounds:

"There is no indication that the California Legislature intended to raise records or parts of records so belatedly established to any greater status than the normal registration records which are never, in cases of birth recordation, to be taken as irrebuttable evidence. In other words, it appears that the role of the superior court in ordering the recordation partakes of an administrative function. It is merely an act of recordation which has been permitted by judicial action rather than by an administrative officer. The judgment in such action is not that the facts so found are absolutely conclusive as between petitioner and the rest of the world, but rather, the judgment is that the registrar is ordered to make such a recording."

The court went on to say:

"It is important to note that even if the California Legislature did intend that such a determination was conclusive (which this court finds it did not intend to do) such an intention would, most probably, run afoul of Constitutional prohibitions. Making such an ex parte appearance conclusively establish the facts surrounding a person's birth or death might well infringe on and conclusively determine the rights of any third person having contractual or other relations with, and regulatory duties concerning, such person. This would appear to deny such third person due process."

For a similar holding see *Ex parte Lee Fong Fook*, 74 F. Supp. 68 (N. D. Cal. 1948), where the Federal District Court held that jurisdiction to adjudicate citizenship status of a United States resident has never been conferred by Congress on State courts and, consequently, any State court judgment purporting to exercise that jurisdiction cannot, to that extent, claim of the Federal courts full faith and credit.

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*Prepared by the Office of the General Counsel,  
Department of Health, Education, and Welfare.*

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# Evaluating Program Progress

By ANDIE L. KNUTSON, Ph.D.

EVALUATION is concerned with determining value or worth. Each of us is constantly making evaluations in our everyday lives. We judge ideas or actions in terms of right or wrong, good or bad, honest or dishonest, and practical or impractical so frequently and so quickly that we are often unaware that we are doing so.

We draw upon the full range of our experiences in making these judgments or evaluations, testing each one against our personal and professional patterns of value or concern and against estimates of their relevance to the situation at hand. This weighing process may be either conscious or subconscious, objective or intuitive. Thus, decisions are often made without adequate consideration of pertinent facts available; sometimes they are made without considering the possibility of obtaining such facts.

Program evaluation is concerned with determining the worth or value of efforts to achieve a given purpose or objective. The specific purposes of evaluation in this situation are to provide objective estimates of achievement and to provide guidance for the conduct of program activities. To achieve these purposes, two types of evaluation are required—first, “evaluation

of program achievement” and second, “evaluation of program progress.”

Sound evaluation studies of program achievement are essential if we are ever to know whether or not we are attaining the goals for which we strive. The public, too, has a right to know whether our efforts and money are well spent.

Concrete and valid evidence of the achievement of public health programs is frequently most difficult to obtain. Many of the objectives are broad and hard to reach. Often we may not reasonably expect observable positive results until the program has been under way for years. With some hold-the-line operations, failures are easier to define than successes. Many outside influences quite apart from public health efforts may effect the achievement of the long-range objectives in positive or negative ways. On-going program activities must be continued in the best possible manner even in the absence of the measures of achievement which are only available after the program has been in operation for some time.

## Program Progress

Thus, the process of evaluating program achievement is not adequate for satisfying the second of the two objectives of evaluation—providing guidance for program activity. To achieve the purpose of program guidance, objective data need to be obtained and applied throughout the phases of program planning, development, and operation. Objective evaluation must take its deserved role as part of the daily routine of each health worker.

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*Dr. Knutson, chief of Behavioral Studies, Division of General Health Services, Public Health Service, presented this paper in part at Pennsylvania's Third Annual Health Conference held at State College, August 1954.*

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In the course of evaluating program progress, it is possible to identify difficulties or barriers as they occur and to make necessary changes on the basis of the best objective data available. Sound evaluation of progress made as a program continues day by day can help to assure that each new phase of the program is built on the positive achievements of the preceding phases.

The concept of evaluating program progress is of value whether we think in terms of the health department program as a whole, in terms of a particular program, or in terms of the efforts of the individual health worker with his personal and team responsibilities.

The purpose of evaluating program progress is to improve the quality of decisions made at any point during the planning, development, and operation of a program.

Since many programs are in operation concurrently in any health department, different types of decisions may have to be made at the same time. Overlappings occur, but for the purpose of this discussion, I have grouped the program decisions to be made into the four broad types of those concerned with:

1. The nature of the interests, wants, or needs the program is intended to satisfy.
2. The broad purposes of the program and the philosophy of approach or policies to be followed in trying to achieve these purposes.
3. The selection or development of the methods, techniques, or procedures to be used in the program.
4. The application of philosophy, policies, and methods in carrying out the operation of the program.

### Interests and Needs

We all tend to assume that other people want and need the same things that we would want and need if we were in their situations. We assume we know what they need, without recognizing that in making that assumption we are making a decision. An important question of progress evaluation is: Have the interests, needs, or wants we are trying to satisfy been adequately identified?

Exploratory fact finding is one way of assuring adequate identification of needs or wants.

Questionnaires, interviews, projective tests, group discussions, analysis of statistical data—all sorts of techniques can be used to gather necessary data. Whichever method is used, it is important to try to obtain the other person's identification of needs or desires from his point of view—as he describes them. We need to be careful that the very nature of our questions or approach does not limit his thinking to our own ideas about the possibilities.

The methods of obtaining data for use in evaluating program progress do not need to be complicated. In fact, often the simplest method yields the greatest return.

The nurse who encourages a mother to pour out her troubles and waits patiently for her to identify the things with which she needs help is applying one of the best exploratory techniques. Sometimes simply helping the mother to formulate the problem clearly will enable the mother herself to identify some constructive action to take. Maximum value of the technique occurs when the nurse makes sure that she has given some help on as many as possible of the specific things identified. Referring the mother to some other source of assistance is sometimes as effective as providing her with materials or guidance. Knowing how the mother perceives her problem may be the key to developing an effective solution. If the solution is meaningful to her, there is a much greater likelihood that she will carry out the action after the nurse leaves.

No public health worker has the time and opportunity to make a thorough study of the other person's interests, wants, and needs every time a decision has to be made. But all of us can profit by identifying as a decision each assumption we make about needs and by being as objective as we can in making that decision. We can all profit also by trying out the more thorough method of exploration with a part of the case load. For example, it might be possible to apply this principle regularly on the first home visit or restaurant inspection carried out each morning. Although initially more time will be spent in these instances, the additional effort may help to identify and solve problems that might otherwise drag on indefinitely.

The same principle applies in identifying community needs. Recently a health educator

in a local community seeking to identify the needs upon which to build a sound health education program first made a survey of public health needs. She identified little that was new or unexpected and was unhappy with the findings because she was certain many health problems were not being reported.

She reviewed her approach and found that she had used questions about health needs and public health problems that meant more to the public health worker than to the people she was interviewing. She had encouraged responses in terms of existing services only and her own ideas about new possibilities. On the basis of this evaluative review, she changed her approach and tried a more open interview which encouraged the respondents to discuss freely the little things families run into when they first move into the neighborhood.

Using this new method, she found that many were concerned about uncontrolled dogs roaming the neighborhood. Others mentioned the need for some type of recreation facilities for preschool children who were playing in the streets since there were no sidewalks. Expectant mothers did not know where to reach the nearest physicians. Mothers with young children desired help on behavior problems. Thus, the open question approach, which was focused toward identifying the problems from the mothers' point of view, yielded data of great value in defining the goals for a community action program.

### **Purposes and Philosophy**

The second major type of program decisions to which progress evaluation can contribute are those concerned with the development of the purposes and philosophy of the program. The second question can be stated as follows: Have the program objectives and philosophy and policies been fully agreed upon, formulated, and written down?

Misunderstanding about the broad purpose of a program and the philosophy of approach or policies to be followed in trying to achieve this purpose is a common source of friction. Often sources of potential conflict can be identified in the beginning of the program through frank and open discussion by all persons directly con-

cerned. Writing down agreements helps to assure clear and workable formulations.

In one instance, discussion along these lines after a program had been in operation for 5 years revealed serious misunderstandings among the members of the staff. Some had perceived the project as a community demonstration program to be discontinued as soon as the local health department was prepared to take over. Others saw it as a research project to test methods of diagnosis and control. They were unaware of the problem of preparing the community for its role. A few perceived it as a program to provide services and seemed unaware of any other purposes. Those who clearly identified the purpose as a demonstration were in disagreement about what they were trying to demonstrate and to whom.

Stating the goals of a program in terms of specific health practices is a good way of keeping plans concrete and practical. This is more than an exercise; it is a test of sound planning. Unfortunately, some of our health objectives are long range and hard to pin down. When they can be specifically identified in this way, however, methods of achieving them can be selected with greater confidence.

If the goal is to influence a specific health practice, such as food handling, it is possible to find out how this particular practice is related to the habit patterns and interests of the people concerned. We need to know how the program ties in with their ways of thinking and behaving, with their way of life. For it is unreasonable to expect ready acceptance of health practices that conflict with personal interests or deep-seated habit patterns.

Clear formulation of objectives requires identifying the intermediate goals that need to be achieved in order to attain the program objectives. Almost any program can be broken down into intermediate steps that can be measured. If the measurement shows that the step has been achieved, one can feel confident in going forward to the next step. If the data suggest that this intermediate step has not been attained, it will be important to find out the reason for failure and pause long enough to find a more effective method for achieving the intermediate goal.

In evaluating progress, it is important to dis-

quick and easy approach. Exhibit evaluators ask each exhibitor to complete in about 25 words this sentence: "The main purpose of this exhibit is . . ." Then they ask a number of members to complete the same sentence while observing the exhibit. In one instance all the observers wrote, "The main purpose of this exhibit is to demonstrate the various uses of isotopes." The exhibitor wrote, "The main purpose of this exhibit is to demonstrate various techniques for testing laundry equipment."

A somewhat similar approach can be used to test whether the practice recommended makes sense to the other person and whether he can easily apply it in the manner intended. A Public Health Service psychologist is studying patient reactions to a low sodium diet booklet. As part of the test, he and his wife went on the recommended diet for several days. They came out with new respect for the difficulties faced by the patient. They had considerable trouble, for example, in using the index, which had been set up from the point of view of a nutritionist, to find such common food items as peanut butter and salad dressing.

A Public Health Service nurse in developing materials for the use of diabetics tried to carry out the exact process outlined in the instructions for injecting insulin. She found it physically impossible to perform all the tasks alone as recommended.

Many health departments are now routinely using tests to tell whether their written materials will be understood by the groups for which they are prepared. The Dale-Chall and the Flesch tests of readability are easy to use. The Flesch test requires only a count of the number of syllables per 100 words and the average number of words per sentence. With these two facts it is possible to estimate the grade level of reading ability required. After some training, any clerical person can apply the test successfully.

For example, one health department, while carrying out a mass X-ray campaign for tuberculosis, received 3 or 4 calls a day from people who asked for an explanation of the notices they

had received about the X-ray findings. An analysis of the reading ease of the notice showed that about eighth grade reading ability was required to understand the message; thus the message could be understood by only about half of the adult population of the community. Since it was important that everyone understand this message, it was simplified to about the fourth grade level of reading ability; then it was tried out on a number of people with low education to make sure that they interpreted it correctly. The health officer has since reported that no calls for explanation are now received.

Major emphasis has been given to the approach of the social scientist rather than to that of the statistician, administrator, or personnel officer. Actions taken in selecting and assigning personnel, for example, directly affect most of the decisions discussed.

One frequently hears that "public health is people," that it is "everybody's business." If public health is so intimately concerned with people, then how well public health is succeeding in its programs may depend on how well our programs are wrapped around people—their needs, their wants, their hopes. The approaches I have been discussing are the types of approaches which are useful in determining whether we are wrapping our programs around people or whether we are attempting to wrap people around our programs.

Through applying the tools of measurement, we can obtain data for the guidance of program improvement as the program continues. We must always be aware, however, that the data obtained in evaluating program progress are not valid for determining whether or not the broad goals of the program are achieved. For this purpose, sound studies of program achievement are essential. Both evaluation of program progress and evaluation of program achievement are essential to satisfy the two major purposes of evaluation—guidance for the conduct of program activities and objective estimates of achievement. Neither can be neglected if we are to make certain that our efforts and money are well spent.



# An Outbreak of Salmonellosis Traced to Watermelon

By GILBERT E. GAYLER, M.D., ROBERT A. MacCREADY, M.D., JOSEPH P. REARDON, M.D.  
and BERNARD F. McKERNAN, M.D.

**W**ATERMELON as a vehicle in salmonellosis outbreaks is not thought to be an important public health hazard, but its possible danger should be recognized by public health officials.

This paper describes an outbreak of salmonellosis spread by watermelon. To our knowledge, its previous occurrence has never been reported. Indeed, while meat products, fowl, eggs, salads, and, occasionally, pastries are common vehicles of *Salmonella* infection, fruits are seldom implicated.

## Epidemiology

Early in June 1954, 17 cases of gastroenteritis occurred in Upton, a rural town in Massachusetts. The 17 cases involved 5 family units, with ages of the patients varying from 2 to 80 years. The patients all had initial symptoms on the same day or the next day. The symptoms were those of nausea, vomiting, abdominal

cramps, diarrhea, and fever. The diarrhea in a number of the patients was unusually severe; it lasted for several days with resulting dehydration and prostration. The 80-year-old patient died of a complicating tibial artery thrombosis, and 1 of the 2 secondary cases of the outbreak occurred in the patient who shared the hospital room of this patient.

None of the 5 family groups had any apparent connection with one another. The only connection they had in common was the purchase of sliced watermelon from the same supermarket in the neighboring town of Milford. Symptoms began in each case 12 to 24 hours after the ingestion of the watermelon.

At first, watermelon appeared to be an unlikely vehicle for the infective agent of the outbreak. However, in 3 of the family units, 1 or 2 members or guests did not eat the watermelon. In each instance these individuals only were not ill. One member of a family ate sparingly of the melon and was only slightly ill. There was, therefore, apparently complete association between the eating of the melon and becoming ill afterward.

The market where the melons were bought was new and clean. The watermelons, which had been on sale for several days before the outbreak, were kept on an open counter. The melons were sold whole or sliced, and the sliced pieces that were awaiting sale were covered with wax paper.

Of the 3 watermelon samples submitted for

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*Drs. Gayler, MacCready, and Reardon are members of the Massachusetts Department of Public Health. Dr. Gayler is district health officer; Dr. MacCready is assistant director, biologic laboratories, and in charge of the diagnostic laboratory; Dr. Reardon is epidemiologist, division of communicable diseases. Dr. McKernan is a practicing physician in Upton, Mass.*

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examination to the health department laboratory—1 from each of 2 families and 1 from the supermarket—salmonellae were recovered in pure culture in immense numbers from the watermelons from both homes but not from the market watermelon. Stools were submitted from 9 of the 17 individuals who were ill. All were positive for salmonellae.

No enteric organisms were recovered from the knife used to slice the watermelons in the store, but salmonellae were recovered from the shelf where the knife was stored when not in use. However, no evidence of rodents could be found in the store, and traps especially set caught no animals. No enteric organisms could be recovered from the three clerks involved in slicing the watermelons; so far as could be ascertained, none of the clerks had had a recent enteric illness.

### The Species *S. miami*

All of the salmonellae recovered were typed at the National Salmonella Center at the Beth Israel Hospital in New York, which classified them as *Salmonella miami*.

*S. miami* has been reported by Galton and Hardy as common in Florida (1, 2). They found this organism to be the cause of a food poisoning outbreak where contaminated pickle served in a restaurant was the disseminating vehicle. At various times they recovered it also from dogs, hogs, chimpanzees, and fowl. Although *S. miami* has been reported frequently in the other southeastern States as well as Florida, it is relatively rare elsewhere. It was, however, recovered in Massachusetts from 9 cases of gastroenteritis that occurred in July 1953, chiefly in the metropolitan Boston area. No definite connection between the cases could be discovered at the time, and we can only speculate as to their possible source.

Since the grower's label pasted on the outside of the watermelons indicated the fruit in the present outbreak came from Florida, and since *S. miami* is widespread in Florida (2), it seems reasonable to postulate that the organism may have come with the fruit from that State, rather than from some case or carrier within the store, where evidence of a human or animal source could not be found.

### Some Speculation

How the individual watermelons became contaminated is, of course, an interesting question. On the supposition that the outside of the melon might, while in the field in Florida, have become contaminated with fecal material containing the organism and that the inside of the melon might have become contaminated only when the fruit was sliced before sale in the supermarket, we conducted a simple experiment at the diagnostic laboratory of the Massachusetts Department of Public Health.

In the experiment, the outside of a watermelon was swabbed with a dilute suspension of the *S. miami* organism, and then the watermelon was sliced with a clean knife. Cultures made from the cut surface, immediately and also after a few hours, each resulted in a few colonies on bismuth sulfite, but cultures made from the cut surface the following day, with the fruit remaining at room temperature in the meantime, resulted in innumerable colonies on bismuth sulfite. This would suggest that a knife by cutting through a watermelon that was contaminated on the outside with *S. miami* certainly could inoculate the watermelon so that the organisms would multiply upon the cut surface, under conditions prevailing in the supermarket where the melons were sliced for sale.

It was found also that a knife contaminated with a dilute suspension of *S. miami* could similarly inoculate a clean watermelon effectively. Thus, infection could be spread from melon to melon whenever the knife was not washed between cuttings.

Quite another method of contamination appears equally possible. The practice of injecting water into watermelons in this country, as well as in Asia, in order to increase their market weight, has been divulged on good authority. Obviously, contaminated water injected through clean watermelon surfaces, or clean water injected through contaminated watermelon surfaces could infect a number of melons.

Either of these means by which the melons could have become infected is, of course, hypothetical since the actual mechanics of the outbreak can hardly be proved. It does seem likely that the original source of salmonellosis was in

Florida where the melons were grown. In view of the huge number of watermelons sold in the market without previous reports of salmonellosis outbreaks, unless such outbreaks have escaped detection in the past, it does not appear that watermelons, whole or sliced, are a significant public health hazard, but they should be recognized by public health officials as a possible danger.

### Summary

An outbreak of gastroenteritis caused by *Salmonella miami* is described. There were 17 primary cases among 5 families and 2 secondary cases.

The only article of food in common was sliced watermelon which had been purchased from the same market. Symptoms occurred 12 to 24 hours after the ingestion of the melon. *S. miami* was recovered from the sliced melon in 2 of the homes, from all of the stools submitted, and from the shelf in the store where the slicing knife was kept.

No evidence of human or animal source could be found in the store.

The melons were obtained from Florida, where *S. miami* is common, and the original

contamination of the melons may have occurred in Florida. Possible mechanics of the contamination of the watermelons are discussed.

. . .

*Since writing this paper we have been informed of a similar outbreak of salmonellosis which occurred in Rochester, Minn., in August 1950. There were 6 cases in 2 families.*

*Each family had purchased half of a watermelon from the same roadside stand on the same day. Salmonella bareilly was cultivated from the remaining portions of the watermelon consumed by both families. Both specimens were heavily loaded with salmonellae. Only one stool specimen was submitted for examination, and this was negative for enteric organisms.*

*The outbreak was not reported in the medical literature.*

### REFERENCES

- (1) Galton, M. M., and Hardy, A. V.: Studies of acute diarrheal diseases. XXI. Salmonellosis in Florida. Pub. Health Rep. 63: 847-851 (1948).
- (2) Galton, M. M., and Hardy, A. V.: The distribution of *Salmonella* infections in man in Florida during the past decade. Pub. Health Lab. 11: 88-93 (1953).

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## Training in Rehabilitation

An intensive training course in methods and concepts of rehabilitation will be given at the University of California at Los Angeles, April 25-30, 1955, under the joint sponsorship of the university and the Office of Vocational Rehabilitation, Department of Health, Education, and Welfare.

Designed to enable participants to serve as leaders in the advancement of coordinated services for disabled persons, the course is offered for the following rehabilitation supervisory personnel: physicians, nurses, physical therapists, occupational therapists, rehabilitation counselors, and social workers. Participants will be selected on the basis of leadership responsibility in key positions in five western States, but general sessions will be open to all interested members of the various professions.

Further information may be obtained from: Dr. W. A. Selle, Chairman, Committee on Rehabilitation, Department of Biophysics, School of Medicine, University of California Medical Center, Los Angeles 24, Calif.

*Unexpected advantages followed application of Iowa's new hog feeding law, aimed at zoonoses. Lower death losses and heavier herds on a given volume of feed were bonuses in a public health program.*

## Garbage Cooking in Iowa

By E. ROBERT BAUMANN, Ph.D., and M. T. SKODJE

**A**N IOWA LAW, which became effective June 1, 1953, requires the cooking of garbage fed to animals. The Iowa Department of Agriculture has the responsibility for enforcement. Regulations issued by the department state that garbage to be fed to swine in the State of Iowa shall be cooked or heated to 212° F. for 30 minutes by one or more of the following methods:

- A. Wet steaming or boiling in an open vat.
- B. Dry steaming or boiling in a jacketed kettle.
- C. Steaming in a pressure cylinder.
- D. Steam boilers.
- E. Direct heating over an open fire.

A survey of the garbage-cooking installations in Iowa was made recently by Iowa State College personnel with the cooperation of the U. S. Bureau of Animal Industry. The survey pro-

vided information on the types of cooking methods being used in the field. This information was used as a basis for the selection of equipment to be used in laboratory studies that the engineering experiment station and the division of veterinary medicine at Iowa State College are now conducting on methods of cooking garbage. The project, titled "The Survival of Swine Disease Organisms in the Heat Treatment of Garbage," is being conducted under a grant from the National Institutes of Health.

### Garbage Feeders in State

Up to June 1, 1953, when the law went into effect, there were more than 400 garbage feeders in the State. Most feeders ceased feeding for several probable reasons: First, little was known about methods of cooking garbage; second, many feeders doubted that garbage could be cooked economically; and third, many feeders doubted that the cooked product would be eaten by the hogs. The number of feeders operating under the new regulations has gradually increased until by July 1, 1954, 13 months later, 60 garbage feeders were again feeding hogs. Since most garbage feeders in Iowa usually feed garbage as a sideline, they are comparatively small-scale operators.

As of July 1, 1954, 52 private feeders had been licensed to process garbage for hog food.

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*Dr. Baumann, formerly research associate in sanitary engineering at the University of Illinois, Urbana, has been associate professor of civil engineering, Iowa State College, Ames, since 1953. Mr. Skodje is associate in civil engineering at the same college. Both are on the staff of the Iowa engineering experiment station. Dr. C. W. Brown, Charles Cumpston, and A. D. Jewell of the U. S. Bureau of Animal Industry assisted in this study.*

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In addition to the private feeders, there were 8 garbage-processing installations located at Federal and State institutions, which do not require a license.

All of the garbage feeders collect, process, and feed commercial garbage, collected principally from restaurants, hospitals, hotels, food markets, and dormitories. Two feeders collect residential garbage and feed some of it along with the commercial garbage. Some handle a restricted type of garbage. Two feeders handle chiefly bakery-dough wastes, and two handle beef or swine offal and bones. The fuel costs vary from a negligible amount for the operator using scrap wood and tires to from 0.5 to 1.5 cents per hog per day for those operators using oil, kerosene, or bottle gas for fuel.

All of the feeders interviewed indicated that they were satisfied with the requirement that all garbage must be heat treated before feeding. They believed that feeding cooked garbage produced unexpected advantages in lower death losses and an ability to increase their herd size on the same amount of garbage.

On July 1, 1954, 5,275 swine were being fed in Iowa on heat-treated garbage. The average herd was about 88 swine; the largest herd of swine was 579 head, and the smallest was 26. During a normal month, about 1,000 garbage-fed hogs are sent to market from these farms. During the maximum month 1,898 garbage-fed hogs were marketed.

A summary of the various types of garbage-cooking methods used in the State is given in the table.

Two private feeders have not been classified

as to method of cooking. One has not yet installed heat-treatment equipment, and his license is pending. The other is cooperating in the study at Iowa State College and is using all the types of cookers listed in the table. His equipment, therefore, would not be indicative of garbage cooking in Iowa.

Because few commercial cookers were available when the cooking law became effective, 70 percent of the cookers now in use are homemade. Sixty-four percent of the Iowa installations are direct-fired cookers, and of these 66 percent are homemade. The usual direct-fired cooker utilizes a flame in direct contact with the outer surface of the cooking vessel in which the garbage is contained. Most of the 25 homemade installations are simple, covered, rectangular or cylindrical tanks mounted on an earth, brick, or concrete block firebox. The farmer feeder usually utilizes oil as a source of heat, but the nonfarmer feeder, usually located on or near dumping grounds, uses waste tires or wood for fuel. None of the homemade installations visited was designed to use fuel economically.

### Direct-Fired Kettles

All 13 commercial direct-fired kettles listed in the table utilize bottle gas, oil, or kerosene for heat. Frequently, the commercial direct-fired cooker is designed as a compact, trailer-mounted, double-walled tank heated with one or two burners. The hot flue gases pass back and forth through the space between the inner and outer walls of the cooker and heat the garbage effectively. Of the 38 direct-fired kettles, only

**Garbage cooking in Iowa, in 52 private installations and 8 Federal and State institutional installations, July 1, 1954**

Method of cooking	Number of installations	Type of construction			Type of fuel					
		Home-made	Commercial	Unknown	Oil	Coal	Wood or tires	Bottle gas	Kerosene	Unknown
Direct-fired kettles.....	38	25	13	0	13	0	15	8	2	0
Direct steam injection.....	17	15	0	2	5	8	1	0	0	3
Dry-steam coil.....	1	0	1	0	1	0	0	0	0	0
Dry-steam jacket.....	2	1	0	1	0	1	0	0	0	1
Pressure cooker.....	1	0	1	0	0	1	0	0	0	0
Not determined.....	1	0	0	0	0	0	0	0	0	0
Total.....	60	41	15	3	19	10	16	8	2	4

2 commercial, trailer-mounted cookers have mechanical stirrers to mix the garbage and assure even cooking. Observations and experiments by the authors both in the laboratory and in the field have verified the conclusion of the operators that the mixing devices provided are ineffective.

Direct-fired cookers normally have the disadvantage of high heat concentrations at the interface between the garbage and the garbage container. Unless the cooker is well designed, much of the heat is lost through the stack. Some of the advantages of this type of cooker are the rapid heating and the control of the moisture content of the garbage. The maximum amount of water in the garbage can be kept at a minimum with this method. The minimum amount of water, however, is fixed by the characteristics of the cooker and the garbage and is the amount of water necessary to prevent scorching or burning. Although the average commercial garbage is quite wet, all of the Iowa direct-fired installations require that some water be added to the garbage before cooking. Some operators have found it best to heat the water in the cooker before adding the garbage. This helps to prevent scorching or burning.

### Direct Steam Injection

Direct steam injection is the second most common method of cooking in Iowa, and 29 percent of all installations are of this type. As the name implies, live steam is injected directly into the garbage to raise it to the boiling temperature. Most of the steam-injection installations are listed as homemade, since the cooking tanks or vats were designed by the operator and fabricated locally. All but one of the installations use commercial steam boilers for steam production. In this one a homemade, closed, cylindrical tank is used for a boiler and the fuel used is wood or old tires. No safety devices are provided at the boiler, and the authors regard this as very dangerous.

The tanks or vats in which the garbage is heated are usually rectangular, truck-mounted units equipped with a removable cover. Tanks are similar but not uniform in construction, and vary in capacity from about 60 cubic feet to 200 cubic feet. Most tanks have metal covers for

heat conservation, although a few have canvas covers.

Two types of racks are in use for distributing the steam throughout the garbage. The first is a removable rack, which is a horizontal grid of pipes with a central steam-pipe header and several transverse laterals. Vertical lances of small diameter pipe are connected to the laterals. The lances are so located that they are spaced uniformly throughout the tank during cooking. Small holes in the vertical pipes permit the steam to flow into the garbage. This pipe rack is lowered into the garbage until the vertical lances penetrate to the bottom of the load. Most operators have found the lance-type pipe rack unsatisfactory because of the labor required to insert the lances into the garbage and because of the uneven steam distribution caused by the steam following the path of least resistance, along the side of the lances.

Although two installations still utilize the vertical lance-type rack, most feeders have converted to the second type of rack used in Iowa. This is a horizontal pipe rack permanently installed in the bottom of the cooking tank. Most installations use a header pipe across the front end of the tank and smaller lateral pipes running lengthwise of the tank. Numerous small holes drilled into the laterals are used for steam distribution. Lateral spacing, hole size, or hole spacing are not uniform. Only two installations are known to provide blowoff valves for clearing the steam lines of condensate and garbage liquor.

Direct-steam-injection cookers provide for maximum heat transfer from the steam to the garbage. A low overall thermal efficiency may sometimes be found, however, if the steam boiler or generator has not been well engineered. Steam produced by the common boiler or low-pressure generator may be a mixture of dry steam vapor and hot water. A boiler or generator in a good garbage-cooking installation should produce steam of high quality. The quality of steam is the percent by weight which is actually dry steam vapor.

The amount of steam required to cook a load of garbage depends upon many factors, including the amount of garbage in the load, the amount of water in the garbage, the temperature of the garbage and the surrounding air, the

physical nature of the garbage and cooker, and the quality of steam used. The hot water included in the steam mixture does not contribute any effective heat during cooking. A possible disadvantage of this method of cooking in colder climates is the large amount of water added to the garbage in the form of condensed steam. None of the feeders interviewed during the recent tour of Iowa, however, found any fault with the amount of water added using this method.

At least two feeders using the direct-steam-injection method of cooking attempted to use commercial steam cleaners for producing steam. The steam produced was found to average about 10–15 percent dry steam and 85–90 percent hot water. The excessive quantities of water added to the cooked garbage by using this low-quality steam forced the abandonment of these steam-producing units. All of the Iowa feeders using direct steam injection operate steam boilers whose steam quality is usually over 90 percent.

#### **Dry-Steam Coils and Jackets**

Dry-steam heating is the term sometimes applied to the method of heat application in which the steam does not come into direct contact with the garbage. Instead, the steam transmits its heat through an inner wall of a steam jacket or through a heating coil placed in the load of garbage. Five percent of all Iowa installations are of this type. An advantage of this method over the direct-injection method is the heat economy brought about by mixing the hot steam condensate with the cold make-up water and returning it to the boiler. As in the direct-fired method, Iowa feeders find it necessary to add water directly to the garbage to prevent the garbage from scorching. For this reason, one operator has constructed a combination truck-mounted, dry-steam and direct-steam-injection cooker. A false bottom about 2 inches deep has been built in the bottom of a rectangular tank. Permanently installed vertical lances spaced uniformly around the periphery of the tank lead upward from the false bottom. The vertical risers contain small holes to permit the escape of some steam from under the false bottom into the garbage. The oper-

ator believes that the garbage can be cooked faster and with less added water; but temperature checks by the authors do not substantiate the operator's opinion.

One feeder in Iowa uses a wet-rendering pressure cooker. Operators of a sausage plant in Iowa are processing the offal from their animals and their death losses for use as swine feed in a vertical, wet-rendering cooker. The offal and bones are cooked under 75 pounds per square inch of steam pressure for 14 hours. The installation combines direct steam injection with cooking under pressure to produce an excellent homogeneous product. The cooker outlet is located on the bottom and opens over an open-top farm tank. The inlet is located at the top of the tank. The offal is raised to the inlet by means of a bucket hoist. The cooked offal is dumped directly into the farm tank. The resulting cooked mass is quite fluid and the liquid is decanted off the top of the tank before feeding. The residue is virtually all edible.

#### **"Cold Spots"**

Recently about one-third of the Iowa installations were visited by the authors. Most of the cookers examined were found to contain "cold spots" in the tanks or areas where the temperatures of the garbage had not reached at least 170° F. when the cooking was supposed to be complete. No field test other than the mechanical location of cold spots in the garbage has been used to determine whether or not the heat treatment has destroyed the swine disease organisms. Interpretation of the Iowa law is that such cold spots should be brought to a temperature of 212° F. for at least 30 minutes. The temperature of the garbage during cooking must be permanently recorded on an acceptable temperature recorder. The operators have been instructed to locate the temperature recorder at habitual cold spots rather than in "hot spots." Methods for controlling garbage cooking to assure more strict compliance with the heating requirements for destroying swine disease organisms are being evaluated at Iowa State College.

All of the cookers were judged to be adequate to bring the garbage to a boil, provided the operator will conscientiously gauge his opera-

tions by the cold spots in his equipment rather than the hot spots. Sanitary procedure in handling the raw and cooked garbage as well as general sanitation around the cooker and pens appears to be one of the most easily broken links in the defense against swine diseases. The average feeder needs to know and to be impressed with the possibility of infecting his animals as well as those of others by laxity in conforming with the sanitary regulations. Accordingly, the average installation feeding cooked garbage is inspected by State and Federal inspectors from 12 to 24 times during a year. The authorities in Iowa are continually working to raise the standards of sanitation at these installations. As a result, a number of the feeders who operate marginal installations are making plans to increase their investment to improve sanitation and the cooking operation and to reduce garbage handling.

#### Liquidation Costs

The costs of installing garbage cookers in Iowa have been estimated to range from \$50 to \$3,000. In most cases, little consideration was given to the labor involved in handling and transporting the garbage during and after cooking. As a result, the garbage frequently must be dipped from the cooking tank by hand and transported manually to the feeding troughs. An increasing number of cooking tanks are being provided with chutes and doors to reduce the handling of the garbage. None of the feeders use grinding equipment to provide a more uniform garbage particle size, even though ground garbage would be easier to handle, would pro-

vide for more efficient transfer of heat, and would perhaps make more of the garbage available to the swine. Only two operators make any attempt to agitate the garbage artificially during cooking to secure more even heat distribution. The cost of the treatment is more than offset by increased income from their herds, for the hogs prefer the cooked garbage to raw garbage and a much larger percentage of it.

#### Conclusions and Comments

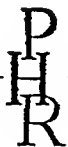
1. The Iowa law requiring the heat treatment of garbage resulted in a drop in the number of garbage feeders from over 400 to 60 feeders. The number of feeders cooking garbage has increased steadily, however, during the last 13 months and may be expected to continue to increase.

2. A majority of the cookers are homemade installations which were not designed for maximum heating efficiency or for fuel economy. Commercial cookers are, however, becoming more popular.

3. The direct-fired cooker is used most frequently for cooking garbage. Direct-steam-injection cookers are also used and are becoming more popular.

4. All of the operators interviewed report that they have gained rather than lost under the new regulations.

5. Only 5,275 swine were being fed cooked garbage in Iowa on July 1, 1954. On January 1, 1955, there were 73 licensed feeders in Iowa, feeding cooked garbage to 8,236 hogs. Six Federal inspectors from the Bureau of Animal Industry are now active in Iowa.



Special reference is made to case confirmation studies on Rocky Mountain spotted fever and endemic typhus in Georgia and to effective tick control measures. McDuffie and Smith discuss tick control in further detail on p. 327.

# The Status of Rocky Mountain Spotted Fever in the Southeastern United States

By JOHN E. McCROAN, Ph.D., RALPH L. RAMSEY, A.B., WILLIAM J. MURPHY, M.D., M.P.H., and  
LILLIAN S. DICK, R.N., B.S.

ROCKY MOUNTAIN spotted fever is unique among the arthropod-borne diseases of man now or formerly endemic in the southeastern United States in that no reservoir host other than the tick vector appears to be required. Transovarian transmission occurs, and larvae, nymphs, and adults are all potentially capable of transmitting the infection. Presumably even the egg might infect if it were crushed on the unprotected skin. Nevertheless, extensive research on rickettsial spotted fever over many years has revealed no naturally infected animal in the United States. When the disease is experimentally transmitted to dogs and other mammals, the infection is frequently silent, and the only indication of inoculation is the develop-

ment of Weil-Felix and complement-fixing antibodies (1).

As is well known, the number of infected ticks in nature is subject to great variation but seldom has been found, even in highly endemic areas, to exceed 3 percent (1). Under ordinary circumstances the infection rate is usually of the order of one in many thousands.

In 1902 Wilson and Chowning (2) suggested that Rocky Mountain spotted fever was tick-borne and that the etiological agent was a protozoan. Subsequently Ricketts (3), Parker and his associates in the Rocky Mountain Laboratory of the Public Health Service at Hamilton, Mont., and many others worked out the etiology and epidemiology of the disease and many of the details of tick-host relationships. Man is merely an unusually susceptible bystander, who by occasional accident intrudes himself into the cycle as a very unsatisfactory host for *Dermacentor andersoni* in the western or for *Dermacentor variabilis* in the eastern United States.

Rocky Mountain spotted fever was first identified in the eastern United States in 1931 by Badger, Dyer, and Rumreich (4). Until 1940 it was believed that the eastern strains were less virulent than the Bitterroot Valley strains,

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but in that year Topping and Dyer (5) reported the isolation of a strain, the W strain, from the Potomac Valley, which was in every way similar to the so-called Bitterroot strain. In 1941, in a note on the epidemiology of Rocky Mountain spotted fever, Topping (6) compared the existing data with regard to age and sex-specific morbidity and mortality from Montana and Idaho with that from Virginia and Maryland. Although he noted some interesting differences in attack rates, he showed that age-specific fatality was essentially the same in the east and the west. He also pointed out that *D. andersoni*, a parasite of large wild animals, occurs in greatest numbers at a distance from human habitation in sparsely settled areas while *D. variabilis* is sufficiently adapted to the dog to justify being named the American dog tick. This difference serves to explain the higher incidence of Rocky Mountain spotted fever among children in the east and among adult men who work in tick territory in the west.

Harrell (1) has assembled more recent and extensive data, shown in table 1, which is confirmatory of Topping's thesis. It will be noted that the fatality rates shown are almost identical for the east and the west. During the same period, 1939-46, Georgia had a fatality rate of 18.9 percent.

### Comparison With Endemic Typhus

In introducing a comparison between Rocky Mountain spotted fever and endemic typhus, it is interesting to note that when the latter disease was first described in the United States, in 1913, by the late Dr. James E. Paullin (7) of Atlanta, existing epidemiological knowledge did not enable him to differentiate between the infection he described and Brill's disease, the separate etiology of which was first suggested by Zinnser (8) in 1934 and finally clarified by Murray and his associates (9, 10), in 1950 and 1951 as a result of post-World War II developments.

In contrast to Rocky Mountain spotted fever, endemic typhus, we now know, is well established in an abundant mammalian host, the domestic rat, which serves as the reservoir from which the infection is transmitted to man. The principal vector is *Xenopsylla cheopis*, the In-

**Table 1. Rocky Mountain spotted fever cases and deaths—selected western and southeastern States, 1939-46<sup>1</sup>**

State	Cases	Deaths	Percent mortality
<i>West</i>			
Wyoming.....	317	58	18.3
Montana.....	260	63	24.2
Colorado.....	106	26	24.5
Total.....	683	147	21.5
<i>Southeast</i>			
Virginia.....	504	92	18.3
Maryland.....	458	86	18.8
North Carolina.....	346	96	27.7
Total.....	1,308	274	20.9
United States total.....	4,033	929	23.0

<sup>1</sup> See reference 1.

dian rat flea. Control efforts, which have been reasonably successful, consist first, of DDT dusting of rat harborages for the purpose of preventing the spread of infection from rat to rat and from rat to man and, second, of rat control measures (11).

A summary of more recent reporting of Rocky Mountain spotted fever in 10 southeastern States, as compared with typhus, is given in table 2. Certain of the data are of particular interest.

First, it will be noted that the southeast has accounted for about one-half of the reported cases of Rocky Mountain spotted fever in the United States during the 1949-53 period.

Second, these data show that typhus in the southeast has reportedly declined from two-thirds of the national total in 1949 to less than one-half the United States total in 1953.

Third, since 1952, more Rocky Mountain spotted fever than typhus has been reported.

Fourth, it appears that the States of the upper south—Virginia, Kentucky, Tennessee, and North Carolina—have a marked predominance of Rocky Mountain spotted fever over typhus and that typhus leads in the Gulf States and Georgia, while South Carolina is approaching a balance between the two diseases. The fatality rate for Rocky Mountain spotted fever in

Georgia during the total period 1939-53 was 18.1 percent, while the typhus fatality rate was 4.9 percent.

### Case Confirmation Studies

Laboratory confirmation of reported Rocky Mountain spotted fever was undertaken in 1939 by the Georgia Department of Public Health in order to determine the true incidence of this disease in Georgia and has been continued to the present time. Confirmation was based on animal protection tests during the early part of the period covered by table 3 and upon complement fixation tests during recent years (see footnote 2, table 3). From the first, these studies have necessarily included cases of endemic typhus because of the similarity in etiology and clinical behavior of the two diseases. Moreover, the Weil-Felix reaction is common to both and not infrequently a case diagnosed as typhus on the basis of a positive Weil-Felix test has been shown to be Rocky Mountain spotted fever. On the other hand, all typhus confirmations recorded from Georgia prior to 1945 were obtained on patients suspected of having Rocky Mountain spotted fever.

A parallel typhus case investigation program came into existence as a result of the reduction in funds available for typhus control. For

planning purposes, it became essential to know whether reported typhus cases gave a true picture of the incidence of this disease.

It will be noted from table 3 that although typhus showed a steady decline after 1945, the incidence of Rocky Mountain spotted fever continued at a comparatively high level through 1949. Much of the decrease in typhus was undoubtedly the result of the DDT and rat control programs (11), and since 1946 the incidence of Rocky Mountain spotted fever has been influenced by the eradication of several suburban foci around Atlanta (15). After about 1949 or 1950, however, the decline in the reported incidence of the two diseases has been affected by the availability of drugs effective in the treatment of rickettsial infections.

The antibiotics—terramycin, aureomycin, and chloramphenicol—produce a marked effect on the clinical course of the two infections. Studies in Georgia and elsewhere also show that these drugs influence the appearance of Weil-Felix and complement-fixing antibodies (14, 16). It is probably safe to say that a relatively small percentage of Rocky Mountain spotted fever and typhus infections now develop to the point of complete diagnosis and reporting.

The notation used in table 4 has no mathematical basis. It is an attempt to show together the Weil-Felix (left) and complement fixation titers (right) on individual specimens. As

**Table 2. Reported cases of Rocky Mountain spotted fever and endemic typhus for the United States and southeastern States, 1949-53**

State	Rocky Mountain spotted fever					Typhus				
	1953	1952	1951	1950	1949	1953	1952	1951	1950	1949
United States total.....	301	327	347	464	570	230	205	378	685	985
Southeastern States.....	145	158	170	226	284	110	108	190	445	649
Georgia.....	14	8	8	13	28	41	27	58	162	214
Alabama.....	7	2	3	15	11	21	11	12	130	142
Tennessee.....	10	15	17	23	33	7	3	15	12	28
North Carolina.....	38	38	61	70	79	0	12	19	12	26
South Carolina.....	9	6	5	12	8	11	10	22	15	22
Mississippi.....	(1)	6	6	5	3	11	25	16	13	12
Louisiana.....	1	0	1	4	1	7	8	22	62	76
Florida.....	0	2	2	0	0	11	11	20	34	123
Virginia.....	60	79	63	77	101	0	0	3	4	3
Kentucky.....	7	2	4	7	20	1	1	3	1	3

<sup>1</sup> No report.

Table 3. Rocky Mountain spotted fever and typhus fever investigations in Georgia, 1939-53<sup>1</sup>

Year	Rocky Mountain spotted fever			Typhus fever		
	Reported cases	Confirmed cases	Deaths	Reported cases	Confirmed cases	Deaths
1953.....	14	9	2	41	13	2
1952.....	8	0	1	32	17	4
1951.....	8	1	3	58	7	5
1950.....	13	8	1	162	51	4
1949.....	28	14	2	214	41	14
1948.....	32	16	8	218	72	18
1947.....	23	18	5	441	145	31
1946.....	34	27	4	606	213	33
1945.....	21	18	5	1, 111	18	59
1944.....	12	11	4	1, 182	2 1	63
1943.....	8	6	3	1, 256	2 4	57
1942.....	8	1	2	1, 153	(2)	52
1941.....	6	0	1	944	(2)	36
1940.....	15	12	2	589	(2)	26
1939.....	7	6	0	1, 131	(2)	44

<sup>1</sup> Includes only cases reported through usual channels to the Georgia Department of Public Health. Does not include 210 typhus cases picked up in epidemiological investigations made by Hill and associates (12, 13) and by Stewart and Hines (14) in Brooks, Grady, Thomas, and Decatur Counties, Ga., during the period January 1945-January 1953.

<sup>2</sup> Data for 1939-46 are based upon case histories and laboratory confirmations obtained by Dr. T. F. Sellers, then director of laboratories, Georgia Department of Public Health (now, director of the department). Typhus cases confirmed during this period were only in those patients suspected of having Rocky Mountain spotted fever. In 1939-40, confirmation was by animal protection tests carried on by the Typhus Research Unit of the Public Health Service at Albany, Ga. From 1942 to 1946, confirmations were based on complement fixation tests performed at the National Institutes of Health. From 1946 to date, complement fixation tests have been carried on in the Chamblee, Ga., and Montgomery, Ala., laboratories of the Communicable Disease Center, Public Health Service.

will be noted, the development of Weil-Felix antibodies is somewhat delayed under the impact of antibiotic therapy while complement-fixing antibodies may not appear for months, and the final titer may be considerably reduced below the levels formerly obtained. The exact interval of delay cannot be stated since specimens were not obtained with this purpose in view. Terramycin, aureomycin, and chloramphenicol appear to manifest an effect in the order named. Penicillin has no effect on either Weil-Felix or complement fixation titers and no effect on the course of the illness.

Five of the nine cases of Rocky Mountain spotted fever confirmed in 1953 were originally reported as typhus. One of the confirmed typhus cases was reported as Rocky Mountain spotted fever. Five of the 29 unconfirmed typhus cases were classified as presumptive, but 24 of these cases remained diagnostic problems even after prolonged study.

Various possibilities suggest themselves with regard to these cases, but it should be recalled that in Georgia almost all "reported" rocky

Mountain spotted fever and typhus are picked up by query as the result of positive Weil-Felix examinations done in health department laboratories. The difficulty is therefore apparently serologic, arising from the suppression of rickettsial infections by antibiotics referred to previously.

Fortunately, followup specimens can be obtained on the majority of Weil-Felix positive cases, and on cases on which complement fixation tests have been requested if the surveillant agency is prepared to assist, either directly or through local health departments, in obtaining specimens. It is also necessary in requesting specimens to persevere to the point at which persistence ceases to be a virtue.

The problem of obtaining convalescent and postconvalescent specimens is difficult indeed when the initial Weil-Felix reaction is negative. Although the case may be diagnosed as spotted fever or endemic typhus, second specimens are seldom forwarded unless the patient continues to be ill after treatment with broad spectrum antibiotics. This leaves the laboratory in a

quandary since it appears impractical to catalog and hold negative serums on suspected cases indefinitely on the assumption that a later specimen may show a rise in titer. Negative specimens are now retained for approximately 1 month in the laboratories of the Georgia Department of Public Health.

#### Tick Control Methods

During recent years the possibility of using certain compounds as tick repellants has been investigated by several workers. These compounds have been applied as dusts and aerosols to skin and clothing and as solutions or emulsions to clothing.

Despite statements in the literature which imply otherwise, roadside and pathside control of *D. variabilis* and, in our experience, of *Amblyomma americanum* is so easily obtained with insecticides that chemical control has very definite application in inhabited areas of high Rocky Mountain spotted fever hazard or even where tick annoyance is the only problem. Dust, sprays, mists, and possibly even fogs, with several of the older insecticides are reasonably effective. It is conceivable that some of the newer insecticides, for example dieldrin (17), would be even more useful, but we have had little occasion to try them in Georgia.

Interest in the control of Rocky Mountain spotted fever in Georgia reached a high point in 1945 following the occurrence of 24 clinical cases, 17 of which were serologically confirmed, in the semiurban regions of De Kalb and Fulton Counties (Atlanta) during the period 1939-45. In 1946, when work was begun in the Alexander Estates section of De Kalb County, the most seriously affected area, the entire section was beginning to drop in the economic scale despite its being conveniently located, already subdivided, and having city conveniences available. When no Rocky Mountain spotted fever cases occurred during the next 2 years, the situation changed completely. By 1951 homes had been erected on every lot available for construction, and a shopping center had developed in the area.

The following insecticides have been used successfully in tick control:

DDT, at the rate of 2.5 lb. of actual insecticide per acre for dusts, sprays, mists, and fogs. If rosin-DDT emulsion is used in a good mist machine, 1.5 lb. of DDT per acre gives good residual control of *D. variabilis* for an entire tick season. No burning of vegetation was noted when rosin emulsion was applied along roadsides.

Chlordane, at 1 lb. per acre, is almost as effective as DDT in dusts, sprays, mists, and fogs.

Table 4. Weil-Felix/complement fixation results in 12 patients diagnosed as having Rocky Mountain spotted fever and treated with antibiotics, 1953-54

Patient	Blood specimen			Time onset to last blood specimen	Drug
	1st	2d	3d		
1-----	640/N	N/N	-----	Months 2	Terramycin.
2-----	-----	N/8	-----	7	Do.
3-----	1280/N	320/N	N/16	6	Do.
4-----	320/N	-/N	320/8	2	Aureomycin.
5-----	N/-	80/64	-----	2	Do.
6-----	320/N	N/-	N/32	6	Do.
7-----	640/N	640/8	-----	2	Do.
8-----	80/N	80/16	-----	6	Chloramphenicol.
9-----	1280/N	1280/N	-----	Days 18	Do.
10-----	N/N	N/N	N/N	9	Do.
11-----	640/N	2560/N	60/64	Months 2	{Terramycin. Chloramphenicol. Penicillin.
12-----	-----	N/256	-----	6	

NOTE: Dash (—) means test not done or results unknown, and N means negative.

Benzine hexachloride, at one-half pound per acre, was inferior to DDT and chlordane. It gave best results when applied as a mist.

Methoxychlor, at 2.5 lb. per acre, gave good immediate control but broke in less than 1 month.

Smith, Cole, and Gouck (18) pointed out in their classic study on the American dog tick that this tick (*D. variabilis*) tends to collect along roadsides and paths. This fact has occasioned the interest of Knutson (19) and others in the use of very narrow dust or spray barriers along roadsides. Glasgow and Collins (20) report use of DDT dust at a rate of 1 lb. per acre in a 4-foot wide strip. Knutson used a low pressure, low gallonage sprayer to apply 1 lb. of DDT per acre in a strip 6-8 feet wide. In a single narrow barrier dust experiment repeated by us, very good results were obtained.

Nevertheless, these methods afford protection only to persons or animals who stay in the road and do not venture across the barrier. Children and dogs have a tendency to go to the ticks even though the ticks cannot come to them. For this reason, and also because power equipment, particularly mist generators, will give excellent coverage of a 50- to 100-foot strip along roadways, a wider swath has been used by us. Results have been equal to those described in narrow barrier experiments, the immediate knockdown is more extensive, and the residual effect is probably as great although no one has had an opportunity to make a comparative study. In addition, McDuffie and associates (21) have reported data which imply that reinfestation tends to occur more slowly when the treated area is large.

Wide-strip spraying is an easier technique in use since one can "offset" the line to be treated and operate from the roadway. Narrow barrier application with power equipment runs afoul of telephone poles, trees, benches, signs, and other obstacles. In wide-strip application it is convenient to apply insecticide in two runs, with the spray or dust aperture pointed at the road edge on one trip and set for maximum distance on the second.

### Summary

Rocky Mountain spotted fever is a disease of measurable though not great public health im-

portance in the southeastern United States. It ranks with or exceeds endemic typhus as a cause of morbidity and mortality in all the States of the area (Alabama, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, and Virginia).

Reporting of all rickettsial infections has been adversely affected by the availability of effective chemotherapeutic agents. The rickettsial infections are so well masked by antibiotics that many cases are aborted and diagnosis with complete laboratory confirmation is a rarity. Development of complement-fixing antibodies is delayed sometimes for 6 or more months. Confirmation of diagnosis in recent years has been achieved largely as the result of epidemiological followup of cases by public health agencies.

Tick repellants have been developed to a point which makes their use practical by persons working or playing in infested areas. Chemical control of ticks in thickly settled Rocky Mountain spotted fever foci has been satisfactorily achieved. Barrier spraying along roadsides is sufficiently simple and effective to merit consideration wherever ticks annoy enough people to make tick control economically acceptable.

### REFERENCES

- (1) Harrell, G. T.: Rocky Mountain spotted fever. *Medicine* 28: 333-369 (1949).
- (2) Wilson, L. B., and Chowning, W. M.: The so-called "spotted fever" of the Rocky Mountains. *J. A. M. A.* 39: 131 (1902).
- (3) Ricketts, H. T.: The role of the wood-tick (*Dermacentor occidentalis*) in Rocky Mountain spotted fever. *J. A. M. A.* 49: 24 (1907).
- (4) Badger, L. F., Dyer, R. E., and Rumreich, A.: An infection of the Rocky Mountain spotted fever type. Identification in the eastern part of the United States. *Pub. Health Rep.* 46: 463 (1931).
- (5) Topping, N. H., and Dyer, R. E.: A highly virulent strain of Rocky Mountain spotted fever isolated in the eastern United States. *Pub. Health Rep.* 55: 728-731 (1940).
- (6) Topping, N. H.: Rocky Mountain spotted fever. A note on some aspects of its epidemiology. *Pub. Health Rep.* 56: 1699 (1941).
- (7) Paullin, J. E.: Typhus fever with a report of cases. *South. M. J.* 6: 36-43 (1913).
- (8) Zinnser, H.: Varieties of typhus virus and the epidemiology of the American form of European typhus fever (Brill's disease). *Am. J. Hyg.* 20: 513 (1934).

- (9) Murray, E. S., Bachr, G., Schwartzman, G., Mandelbaum, R. A., Rosenthal, N., Doane, J. C., Weiss, L. B., Cohen, S., and Snyder, J. C.: Brill's disease. I. Clinical and laboratory diagnosis. *J. A. M. A.* 142: 1050 (1950).
- (10) Murray, E. S., and Snyder, J. C.: Brill's disease. II. Etiology. *Am. J. Hyg.* 53: 22 (1951).
- (11) Greene, H., and McCroan, J. E., Jr.: Residual typhus fever in Georgia. *J. M. A. Georgia* 42: 216-218 (1953).
- (12) Hill, E. L., and Morlan, H. B.: Evaluation of countywide DDT dusting operations in murine typhus control. *Pub. Health Rep.* 63: 1635 (1948).
- (13) Hill, E. L., Morlan, H. B., Utterback, B. C., and Schubert, J. H.: Evaluation of countywide DDT dusting operations in murine typhus control (1946 through 1949). *Am. J. Pub. Health* 41: 396 (1951).
- (14) Stewart, W. H., and Hines, V. D.: Murine typhus fever in southwest Georgia, January 1945-January 1953. *Am. J. Trop. Med. & Hyg.* 3: 883 (1954).
- (15) McCroan, J. E., Jr., and Ramsey, R. L.: DDT dusting as a control measure for the American dog tick, the vector of Rocky Mountain spotted fever in Georgia. *J. M. A. Georgia* 36: 242-244 (1947).
- (16) Lackman, D. B., and Gerloff, R. K.: The effect of antibiotic therapy upon diagnostic, serologic tests for Rocky Mountain spotted fever. *Pub. Health Laboratory* 11: 97-99 (1953).
- (17) Therrien, A. H., Hunter, G. W., III, Moon, A. P., and Adams, A. L.: Tests of potential acaricides against the Lone Star tick. *J. Econ. Entom.* 47: 76-78 (1954).
- (18) Smith, C. N., Cole, M. M., and Gouck, H. K.: Biology and control of the American dog tick. U. S. Department of Agriculture Technical Bulletin No. 905. Washington, D. C., U. S. Government Printing Office, 1946.
- (19) Knutson, H.: A community project for the control of the American dog tick. *J. Econ. Entom.* 45: 889-890 (1952).
- (20) Glasgow, R. D., and Collins, D. L.: Ecological, economic and mechanical considerations relating to the control of ticks and Rocky Mountain spotted fever on Long Island. *J. Econ. Entom.* 41: 427-431 (1948).
- (21) McDuffie, W. C., Eddy, G. W., Clark, J. C., and Husman, C. N.: Field studies on insecticides to control the Lone Star tick in Texas. *J. Econ. Entom.* 43: 520-527 (1950).

## Blind Vending Stand Operators

Nearly 1,670 blind vending stand operators and their employees earned approximately \$4.3 million during fiscal year 1954, the United States Office of Vocational Rehabilitation in the Department of Health, Education, and Welfare reported in January. These are the highest net earnings ever recorded by the blind men and women who operate vending stands under the Randolph-Sheppard and State laws.

In fiscal year 1953 net earnings for these businesses were approximately \$4.5 million.

This year's record was made by the blind operators with the aid of 272 blind and 629 sighted employees. The blind operators averaged \$2,200 each. Virtually all blind persons in the vending stand program were prepared and trained by their State vocational rehabilitation agencies.

Nearly 1,600 stands are currently operated under the Randolph-Sheppard Act, 573 of these being on Federal sites. Under recent amendments to the act, vending stands can be established on all types of suitable Federal property—in national parks, for instance. In the past this authority has applied only to federally owned or leased buildings. The Federal law has always required that preference be given to qualified blind persons as operators of stands on Federal property.

It is estimated that there are 308,000 blind persons in the United States today. Of this number, only about 8 percent are employed in all types of occupations. Experience in the rehabilitation of disabled individuals has indicated that about 25 percent of those disabled by blindness can be rehabilitated into gainful employment.

or emulsion of the repellent by dipping the garment into it or by pouring on enough to saturate it.

Rayon and nylon fabrics should not be treated with repellents. Nylon is nonabsorbent and will not retain enough repellent to be effective, and rayon is injured by some repellents.

A 5-percent solution or emulsion of the repellent will give a deposit of about 2 grams a square foot on denim, ordinary cotton khaki, or light wool clothing. About 3 pints is required to thoroughly wet a complete outfit of socks, shirt, and trousers of these fabrics. A smaller amount is sufficient for lighter fabrics.

Acetone and dry-cleaning solvents are suitable for use in impregnating both cotton and woolen clothing. Slightly less than an ounce of repellent to a pint of these solvents will make about a 5-percent solution. One ounce of repellent, 1 pint of water, and 2 ounces of a good emulsifier, such as Tween 80 or Triton X-100, or 1 ounce of laundry soap, will make an emulsion containing about 5 percent of repellent. The laundry soap should first be dissolved in the water; then the repellent should be added slowly to the mixture while it is being stirred vigorously by hand or with a household mechanical mixer. The synthetic detergents in common use for dishwashing and other household cleaning are not suitable for making emulsions, but most of the soaps are satisfactory.

After clothing has been wetted, it should be wrung out by hand, hung up outdoors, and allowed to dry thoroughly before it is worn. Properly treated clothing will provide good to excellent protection against ticks, as well as chiggers and mosquitoes, for several days to a

week if it is not subjected to wetting by rains or wading in streams or lakes. Clothing should be thoroughly washed and re-treated at weekly intervals or before each infrequent excursion outdoors.

#### REFERENCES

- (1) Bishopp, F. C., Smith, C. N., and Gouck, H. K.: Combating the dog tick, carrier of Rocky Mountain spotted fever in the central and eastern States. U. S. Bureau of Entomology and Plant Quarantine Publication E-454. Revised. Washington, D. C., The Bureau, 1946, 6 pp. Mimeographed.
- (2) Smith, C. N., and Gouck, H. K.: Sprays for the control of ticks about houses or camps. *J. Econ. Entom.* 37: 85-87 (1944).
- (3) Gouck, H. K., and Smith, C. N.: DDT to control wood ticks. *J. Econ. Entom.* 40: 303-308 (1947).
- (4) McDuffie, W. C., Eddy, G. W., Clark, J. C., and Husman, C. N.: Field studies with insecticides to control the lone star tick in Texas. *J. Econ. Entom.* 43: 520-527 (1950).
- (5) Gouck, H. K., and Flinn, J. A.: Field tests on control of American dog tick in Massachusetts. *J. Econ. Entom.* 43: 698-701 (1950).
- (6) Glasgow, R. D., and Collins, D. L.: Ecological, economic, and mechanical considerations relating to the control of ticks and Rocky Mountain spotted fever on Long Island. *J. Econ. Entom.* 41: 427-431 (1948).
- (7) Bishopp, F. C., Smith, C. N., and Gouck, H. K.: The brown dog tick, with suggestions for its control. U. S. Bureau of Entomology and Plant Quarantine Publication E-292. Revised. Washington, D. C., The Bureau, 1946, 4 pp. Mimeographed.
- (8) Smith, C. N., and King, W. V.: Field studies of tick repellents. *Am. J. Trop. Med.* 30: 97-102 (1950).
- (9) King, W. V.: Repellents and insecticides available for use against insects of medical importance. *J. Econ. Entom.* 44: 338-343 (1951).

# Relationship of Industrial Carcinogens to Cancer in the General Population

By PAUL KOTIN, M.D., and W. C. HUEPER, M. D.

AWARENESS of environmental cancer and recognition and acceptance of the extent of this problem are increasing in the United States.

A rapidly growing accumulation of evidence suggests that industry-related or occupational cancer hazards carry as a corollary a similar, though diluted or attenuated, hazard for the general population. The industrialization of society during the past half century has resulted in certain new socioeconomic phenomena, one of which has been the concentration of population in close proximity to industrial sources of environmental pollution. This concentration

of population and the recent advent of the atomic age, the era of synthetics, and the petroleum economy, when combined with epidemiological observations, indicate that a general population hazard is of more than theoretical significance.

This hazard may be evaluated by two complementary methods of study. The first is an epidemiological-statistical analysis of both occupationally and environmentally exposed persons, using morbidity and mortality data; the second is the experimental assessment of the carcinogenicity and carcinogenic potency of known and suspected materials in the environment. The summation of both approaches often permits of conclusions impossible with either approach alone. Questions as to the value of experimental studies may be disposed of on the basis of the knowledge that confirmed or highly suspect environmental carcinogens have been proved to be carcinogenic for appropriate animal species. For those substances in which carcinogenicity is still lacking suggestive confirmation, experimental studies have been essentially unsuccessful in terms of tumor production.

In those other instances in which proved experimental carcinogens have thus far failed to demonstrate an analogous human tumorigenic response, it must be remembered that latency or the initiation-promotion-tumor development sequence in human beings is a long one and substances such as plastics (1), selenium (2),

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**Communities awarded milk sanitation ratings of 90 percent or more, 1953-54—Continued**

**100 PERCENT OF MARKET MILK PASTEURIZED**

<i>Community</i>	<i>Date of rating</i>	<i>Community</i>	<i>Date of rating</i>	<i>Community</i>	<i>Date of rating</i>
<i>Georgia—Continued</i>		<i>Indiana—Continued</i>		<i>Mississippi—Continued</i>	
La Grange.....	7-15-1954	New Castle.....	2-1953	Clarksdale.....	10-13-1954
Quitman.....	4-9-1953	Richmond.....	5-15-1953	Columbus.....	3-26-1954
Savannah, Chatham County.....	8-12-1954	Rushville.....	6-1953	Corinth.....	6-11-1953
Statesboro.....	12-3-1954	Shelbyville.....	9-1954	Greenville.....	9-14-1954
Swainsboro, Emanuel County.....	5-5-1954	Valparaiso.....	5-13-1954	Greenwood.....	4-19-1954
Tifton.....	6-18-1953	Vincennes.....	9-4-1953	Houston.....	5-28-1953
Valdosta.....	4-29-1954	<i>Iowa</i>		Iuka.....	7-9-1953
Waycross.....	2-4-1954	Des Moines.....	8-12-1953	Louisville.....	9-16-1953
<i>Idaho</i>		Marshalltown.....	1-29-1953	Macon.....	6-11-1954
Moscow.....	9-1953	Sioux City.....	9-18-1953	Meadville.....	10-13-1954
<i>Indiana</i>		Waterloo.....	10-7-1953	Okolona.....	5-28-1953
Anderson.....	6-18-1953	<i>Kansas</i>		Ruleville.....	4-13-1954
Bedford.....	8-30-1954	Dodge City.....	4-20-1953	Tupelo.....	4-8-1953
Berne.....	3-3-1953	<i>Kentucky</i>		Vicksburg.....	7-10-1954
Bloomington.....	6-1954	Bowling Green.....	1-7-1954	Winona.....	11-24-1953
Bluffton.....	3-6-1953	Brandenburg.....	8-12-1954	<i>Missouri</i>	
Calumet Regions.....	6-12-1953	Frankfort and Franklin County.....	7-23-1953	Lebanon.....	2-13-1953
East Chicago		Fulton County.....	1-21-1954	St. Joseph.....	7-16-1953
Gary		Georgetown.....	10-16-1954	St. Louis.....	12-10-1953
Hammond		Hickman.....	1-20-1954	Springfield.....	3-2-1954
Cooperative Grade A Milk Program.....	6-28-1954	Hopkinsville.....	12-10-1953	<i>Nevada</i>	
Holland		Leitchfield.....	11-24-1954	Ely, McGill, and Ruth..	4-6-1954
Huntingburg		Louisville and Jefferson County.....	4-7-1954	<i>North Carolina</i>	
Jasper		Monticello.....	7-13-1954	Avery County.....	1-15-1954
Tell City		Morgantown.....	1-8-1954	Burke County.....	1-15-1954
Crawfordsville.....	10-2-1953	Murray.....	4-29-1954	Charlotte.....	1-4-1954
Edinburg.....	12-1953	Newport and Campbell County.....	11-3-1953	Chatham County.....	11-19-1953
Elkhart.....	9-1954	Owensboro.....	6-18-1954	Clay County.....	10-27-1953
Evansville.....	6-30-1953	Owenton and Owen County.....	4-2-1953	Craven County.....	2-12-1954
Franklin.....	12-1953	Paducah and McCracken County.....	8-18-1953	Cumberland County..	1-20-1954
Greencastle.....	5-19-1954	Pendleton County.....	4-2-1953	Durham County.....	7-27-1954
Huntington.....	9-25-1953	Williamstown and Grant County.....	4-2-1953	Granville County.....	7-21-1953
Indianapolis.....	9-15-1954	<i>Mississippi</i>		Guilford County.....	6-28-1954
Lafayette and West Lafayette.....	10-14-1954	Aberdeen.....	10-7-1953	Henderson-Transylva- nia Counties.....	2-18-1954
Lebanon.....	6-1953	Amory.....	10-7-1953	Lee County.....	11-19-1953
Logansport.....	4-9-1954	Boonesville.....	9-9-1953	Mitchell County.....	10-23-1953
Madison.....	8-1954	Brookhaven.....	3-4-1954	Nash County (exclud- ing Rocky Mount)..	9-17-1953
Martinsville.....	11-20-1953			New Hanover County..	5-28-1954
Mount Vernon.....	10-18-1954			Northampton County..	4-21-1954
Muncie.....	1-28-1953			Onslow County.....	5-6-1953
Nappanee.....	11-1953			Orange County.....	6-9-1953
				Person County.....	3-17-1953
				Pitt County.....	5-15-1953
				Richmond County.....	2-2-1954

**Communities awarded milk sanitation ratings of 90 percent or more, 1953-54—Continued**

**100 PERCENT OF MARKET MILK PASTEURIZED**

<i>Community</i>	<i>Date of rating</i>	<i>Community</i>	<i>Date of rating</i>	<i>Community</i>	<i>Date of rating</i>
<i>North Carolina—Continued</i>		<i>Tennessee—Continued</i>		<i>Utah</i>	
Rockingham-Caswell Counties.....	3-12-1954	Memphis.....	3-25-1954	Ogden.....	11-10-1953
Rocky Mount.....	9- 8-1953	Milan.....	6-30-1954	Salt Lake City.....	3-30-1954
Wilson County.....	9-18-1953	Morristown.....	5-26-1954	Utah County.....	6-10-1953
<i>Oklahoma</i>		Murfreesboro.....	7- 2-1953	<i>Virginia</i>	
Ardmore.....	4-21-1954	Nashville and David- son County.....	10-28-1953	Abingdon.....	11- 5-1953
Duncan.....	1-19-1954	Newport.....	10- 5-1954	Bristol.....	11- 5-1953
Guthrie.....	5-25-1954	Pulaski.....	6- 3-1953	Buena Vista.....	8- 4-1953
Mangum.....	12-17-1953	Shelbyville.....	6- 9-1954	Front Royal.....	8- 7-1953
Okmulgee.....	10-13-1953	Sparta.....	5- 5-1954	Lexington.....	8- 4-1953
Seminole.....	10- 1-1954	Spring City.....	5-14-1953	Luray.....	8- 7-1953
Sulphur.....	2-18-1953	Springfield.....	7- 6-1953	Marion.....	11-18-1953
Tulsa.....	7-28-1954	Trenton.....	6-30-1954	Norfolk.....	5-18-1954
<i>Oregon</i>		Union City.....	8-12-1953	Portsmouth.....	5-18-1954
Eugene.....	6-11-1953	<i>Texas</i>		Richmond.....	4-16-1954
Klamath Falls.....	5- 7-1954	Brenham.....	4-10-1953	Roanoke.....	8-20-1954
Pendleton.....	6-19-1953	Brownwood.....	7-16-1954	South Boston.....	3- 8-1954
<i>South Dakota</i>		Bryan.....	8-30-1954	Staunton.....	6-25-1954
North Hill Unit.....	7-20-1953	Dallas.....	9-29-1954	Suffolk.....	7- 1-1954
Belle Fourche.....		Denison.....	6-24-1954	Waynesboro.....	6-25-1954
Deadwood.....		Donna.....	2-25-1953	Williamsburg.....	10- 9-1953
Lead.....		Edinburg.....	2-25-1953	<i>Washington</i>	
Spearfish.....		Falfurrias.....	5- 5-1953	Bellingham.....	8-21-1953
Sturgis.....		Galveston.....	7-24-1954	Cowlitz County.....	7-30-1953
<i>Tennessee</i>		Harlingen.....	6- 1-1953	Everett.....	6-22-1953
Athens.....	8-10-1954	Houston.....	5-28-1954	Port Angeles.....	9-10-1953
Bristol.....	11- 5-1953	Kerrville.....	8-13-1954	Spokane.....	9-16-1954
Clarksville.....	1-30-1953	Kilgore.....	7-14-1954	Walla Walla.....	10-15-1953
Cleveland.....	10-13-1954	Lufkin.....	3- 9-1953	Whitman County.....	10-14-1954
Clinton.....	4-21-1954	McKianey.....	2-17-1953	<i>Wisconsin</i>	
Columbia.....	5-19-1954	Mercedes.....	2-25-1953	Beaver Dam.....	2-27-1953
Cookeville.....	6-16-1953	Mineral Wells.....	2-11-1953	Burlington.....	3-26-1953
Dandridge.....	11-10-1953	Mission.....	2-25-1953	Delavan.....	3-26-1953
Fayetteville.....	6- 2-1953	Nacogdoches.....	9- 3-1954	Eau Claire.....	3- 5-1953
Franklin.....	5-20-1954	New Braunfels.....	9- 2-1954	Elkhorn.....	3-26-1953
Gallatin.....	7- 8-1952	Pampa.....	4- 7-1953	Fontana.....	3-26-1953
Greeneville.....	6- 5-1954	Pharr.....	2-25-1953	Green Bay.....	9-17-1953
Humboldt.....	6-30-1954	Port Arthur.....	6-29-1954	Lake Geneva.....	3-26-1953
Jefferson City.....	5-26-1954	San Antonio.....	3-25-1953	Madison.....	10-26-1953
Johnson City.....	9-23-1954	San Benito.....	5-30-1953	Manitowoc.....	6- 4-1953
Kingsport.....	10- 8-1953	San Juan.....	2-25-1953	Ripon.....	2-27-1953
Knoxville.....	8- 6-1953	Sweetwater.....	2-10-1953	Sheboygan.....	6-19-1953
Lebanon.....	8-27-1954	Texas City.....	6- 4-1954	Tomah.....	5- 6-1953
Lewisburg.....	6-10-1954	Texas City.....	1-20-1953	Waupun.....	2-27-1953
Livingston.....	1-27-1954	Tyler.....	2-10-1953	Williams Bay.....	3-26-1953
Loudon.....	5- 6-1954	Weslaco.....	2-25-1953		
		Wichita Falls.....	4- 6-1954		

**Communities awarded milk sanitation ratings of 90 percent or more, 1953-54—Continued**

**BOTH RAW AND PASTEURIZED MARKET MILK**

<i>Community and percent of milk pasteurized</i>	<i>Date of rating</i>	<i>Community and percent of milk pasteurized</i>	<i>Date of rating</i>	<i>Community and percent of milk pasteurized</i>	<i>Date of rating</i>
<i>Arkansas</i>		<i>Montana</i>		<i>Tennessee</i>	
Little Rock, 99.3-----	4-20-1953	Missoula, 99-----	11- 5-1954	Dayton, 92.1-----	5-14-1953
<i>Florida</i>		<i>North Carolina</i>		Harriman, 98-----	10-15-1953
Dade County, 99.99---	1-8 -1953	Buncombe County,		Jackson, 98.6-----	11- 5-1953
Eseambia County,		97.8-----	6-25-1953	Kingston, 96-----	10-14-1953
99.6-----	6-30-1954	Davidson County,		McMinnville, 90-----	5- 5-1954
Manatee County,		96.4-----	7-28-1953	<i>Texas</i>	
99.57-----	8-21-1953	Haywood County, 95--	11- 5-1953	Abilene, 98.9-----	6-15-1954
<i>Georgia</i>		Lenoir County, 78.4---	1-30-1953	Amarillo, 98-----	5-11-1954
Cedartown, 97.7-----	11-19-1954	Moore County, 93.6---	3-12-1954	Austin, 98.6-----	6-11-1954
Gainesville - Hall		Robeson County, 96.8--	1-11-1954	Brady, 94-----	8- 7-1954
County, 92.2-----	4- 9-1954	Vance County, 91.2---	7-22-1953	Brownsville, 96-----	5-29-1953
Griffin, 98.2-----	9- 3-1954	Wake County, 99.3---	3- 4-1953	Childress, 87-----	2- 4-1953
Marietta, 96.2-----	5- 4-1954	Wilkes County, 91.9--	9- 2-1953	Fort Worth, 99.97---	4-28-1954
Newnan, 92.8-----	7-23-1954	<i>Oklahoma</i>		Gladewater, 98.8---	7-14-1954
Thomaston, 87.4-----	6-17-1954	Ada, 87-----	7- 8-1953	Longview, 99.6-----	7-14-1954
Thomasville, 99.5-----	6-17-1953	Elk City, 98.8-----	4-29-1954	Lubbock, 99-----	8-20-1954
Toccoa - Stephens		Enid, 96.6-----	3-30-1954	Marshall, 91-----	4-26-1954
County, 88-----	4- 9-1954	Henryetta, 88-----	1-16-1953	Palestine, 95.1-----	6-15-1954
Washington - Wilkes		Hobart, 90-----	1-23-1953	Paris, 92.6-----	9-25-1953
County, 99-----	9-24-1953	Lawton, 99-----	12- 1-1953	Waco, 99-----	7-28-1954
Winder, 97.9-----	1-23-1953	Norman, 98-----	2-19-1954	<i>Washington</i>	
<i>Idaho</i>		Oklahoma City, 97.8--	9-28-1953	Seattle-King County	
Twain Falls, 98.96-----	4-15-1954	Ponca City, 92.6-----	2- 4-1954	99.7-----	6-23-1953
<i>Kentucky</i>		Shawnee, 98.9-----	12-17-1953	Tacoma, 99.7-----	7-16-1954
		Stillwater, 97-----	4-29-1954	<i>West Virginia</i>	
Henderson, 98.9-----	9-23-1954	<i>Oregon</i>		Kanawha County, 98--	6-25-1954
Princeton and Cald-		Astoria, 97.9-----	4-22-1953		
well County, 94.7---	6-----1953	Portland, 99.4-----	9-30-1954		
Somerset, 91-----	2-----1953	Salem, 99.3-----	4- 6-1953		

NOTE: In these communities the pasteurized market milk shows a 90-percent or more compliance with the grade A pasteurized milk requirements, and the raw market milk shows a 90-percent or more compli-

ance with the grade A raw milk requirements, of the Milk Ordinance and Code Recommended by the United States Public Health Service.

Note particularly the percentage of the milk pasteurized in the various

communities listed. This percentage is an important factor to consider in estimating the safety of a city's milk supply. All milk should be pasteurized, either commercially or at home, before it is consumed.

*Arrest and cure of cervical cancer may be achieved in many cases by recognizing malignant cells before they become invasive. Described is the exfoliative cytology technique of screening patients for early and unsuspected uterine cancer.*

## Uterine Cancer Case Finding by Vaginal Cytology

—Memphis and Shelby County, Tennessee—

By JOHN E. DUNN, JR., M.D., M.P.H., and DOUGLAS H. SPRUNT, M.D.

EXFOLIATIVE CYTOLOGY as a technique for recognizing cancer cells shed or abraded from epithelial surfaces has greatly facilitated the recognition of carcinomata before they become invasive, particularly carcinoma of the uterine cervix. Such a carcinoma is not apparent by its mass or by its surface, and on visual inspection, it is not distinguishable from normal or benignly altered epithelium. Discovery, therefore, at this stage is largely dependent on recognizing suspicious cells sampled from epithelial surfaces. Blind sampling of larger surfaces can be accomplished more efficiently by smear than by biopsy, although this fact has no bearing on the relative merits of the two procedures for establishing a final diagnosis.

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The cytological technique in finding cases of cervical carcinoma presents some practical difficulties, but these are not insurmountable. In Memphis and Shelby County, Tenn., an area with a population of about 165,000 adult females, a uterine cancer case-finding study was begun in August 1952 to be continued for a 3-year period, or until all women who are participating have had an opportunity to have three successive examinations at yearly intervals.

One of the objectives of the study is to determine age-specific incidence and prevalence rates for carcinoma in situ and for presymptomatic carcinoma of the cervix. Because carcinoma in situ of the cervix is frequently present in younger women, all females aged 20 years and over are offered the opportunity for cytological examination.

Although the original technique for cytological examination was based on examination of the exfoliated cells in vaginal pool specimens (1), most cytology laboratories find it expedient to examine a specimen taken directly from the cervix only or a cervical specimen in conjunction with the vaginal pool specimen. In this study, vaginal pool specimens are used exclusively in initial screening, since they can be taken by personnel who are not physicians.

## Organization of the Study

Specific plans for implementing the project were developed after the Memphis and Shelby County Medical Society had endorsed preliminary plans. The cytology laboratory is equipped and staffed by the National Cancer Institute of the Public Health Service. The division of pathology and bacteriology of the University of Tennessee furnishes space, supervises the operation of the project, and examines biopsy specimens from indigent patients. With the cooperation of the other pathologists in this region, this division sees all other biopsies recommended because of cytology findings.

A policymaking committee composed of the organizations participating and cooperating in the study includes representatives of the divisions of pathology and bacteriology and of obstetrics and gynecology of the University of Tennessee, the Memphis and Shelby County Health Department, the Shelby County Medical Society, the Bluff City Medical Society of Negro Physicians, the Shelby County Unit of the American Cancer Society, and the Public Health Service. The general plan of the study was approved by this committee, and in July 1951 preparations were begun to put the project into operation. A year was allowed for establishment of the cytology laboratory and the training of personnel.

### Cytology Laboratory

Staffing the cytology laboratory and training technicians to handle the anticipated volume of 400 cytology specimens a day was the first step in organizing the project.

The laboratory staff is composed of a pathologist, a chief technician, 3 secondary screeners, and 12 primary screeners. The primary screeners work in groups of 4 under a secondary screener, who is responsible for supervising and checking their work. The 3 secondary screeners are supervised and their work is checked by the chief technician. Final review and interpretation of suspicious and positive slides are the responsibility of the pathologist.

One additional technician examines all cervical specimens when these are requested as repeat examinations. We believe that this is

important, since a smear from the cervix has so many more cells than a smear from the vaginal pool that a technician shifting from the examination of one type of specimen to the examination of the other is likely to become inefficient in both procedures.

Training of the staff was begun in July 1951. Three technicians who had had experience in cytology screening in a Public Health Service laboratory and one technician who had had training in the division of pathology and bacteriology of the University of Tennessee formed the nucleus of the staff. A physician with some training in pathology and with experience in cytology was also available for training and eventual supervision of the cytology laboratory.

Because additional technicians were not available, recent college graduates were interviewed, and 12 were selected as trainees. After a period of preliminary training, three of the best qualified technicians were sent to the cytology laboratory of the Vincent Memorial Hospital in Boston for additional training for supervisory positions. This laboratory uses vaginal pool specimens exclusively.

The cytology laboratory supplies the physicians of the community with materials for taking specimens from their private patients, collects the specimens periodically, and replenishes supplies of materials.

The amount of information which physicians are requested to submit to the laboratory with specimens is kept to a minimum: name, age, race, and home address; age at marriage; pregnancy history—age at first and at last pregnancy, number of pregnancies, and date of last menses; history of vaginal bleeding; history of surgery or radiation therapy in the pelvis; and name and address of physician or clinic submitting the specimen.

Since the cytology examination serves as a screening procedure, the laboratory report to the physician or clinic either indicates that the findings are negative or recommends further study—additional cytology specimens or biopsy, depending on the judgment of the pathologist—without specifying a provisional diagnosis. Because the initial cytology examination is made on a single vaginal pool specimen, slides containing abnormal but not definitely suspicious cells warrant, in addition to a second vagi-

nal pool specimen, a repeat examination with a specimen taken directly from the cervix.

A negative report is accompanied by a stamped postal card addressed to the patient, informing her that the results of her test are negative and urging her to repeat the examination in a year. The private or clinic physician signs the card and mails it to the patient.

### Record Unit

The record unit of the laboratory keeps a record of all women for whom cytology specimens are examined, the results of this examination, and a record of tissue examinations up to the point of final diagnosis. Space is provided on the back of the record card for recording the cytology findings and the report of biopsy when this is recommended and completed.

The unit is staffed with a supervising clerk, 2 record clerks, and 1 coding clerk, who codes the recorded material for preparation of punch-cards to be used in the mechanical tabulation of data for analysis. The coding clerk also assists with routine recordkeeping when necessary.

The record unit keeps a tickler file of all patients for whom additional diagnostic study has been recommended. If the initial examination indicates a need for additional cytology specimens, the arrival of such specimens in the laboratory indicates that followup has been successful. If no specimens are received, further followup is carried out.

### Followup

The physician is responsible for contacting private patients for whom the cytology report indicates the need for further study. Two weeks after the report is sent to the physician, the cytology laboratory makes a telephone inquiry to him concerning the patient's response. If a biopsy has been taken, the name of the pathologist who examined the specimen is noted, and his findings are recorded on the patient's card in the record unit. If a biopsy has not been taken, the laboratory contacts the physician's office periodically until the patient returns for further study and a report of the

results of examination is available. For both private and clinic patients, if cancer is found the case is closed as far as the cytology laboratory is concerned. Therapy becomes the responsibility of the private physician or the gynecology clinic.

The followup services of public health nurses are available to private physicians, although most physicians prefer to assume this responsibility themselves.

Clinic patients for whom further study has been recommended are followed up by the division of public health nursing of the Memphis and Shelby County Health Department. The cytology laboratory sends referral slips to the health department to be given to the general public health nurse who serves the area in which the patient lives. The nurse contacts the patient personally and makes clinic appointments for further examination.

The health department nurse responsible for supervising cytology referrals periodically checks with the record unit of the cytology laboratory to determine which patients are not responding to followup, and when necessary, she sees that additional visits are made by a general public health nurse. If repeated followup visits are unsuccessful, the supervising nurse makes a home visit in a final effort to persuade the patient to come in for further diagnostic study.

### Clinics for Indigents

After the vaginal cytology study was organized, all adult female patients at the clinic for indigents in the Gailor Out-Patient Clinic of the City of Memphis Hospitals and the women who accompanied them to the clinic were informed that cytology examinations were available in the clinic newly established for that purpose. The large attendance, chiefly Negroes, and the response of the patient to the cytology service made this clinic a very productive source of material for study. Since the gynecology clinic is held in the same building as this cytology clinic for indigents, the latter has become the central clinic for indigent patients who come for repeat smears and for referral for further study.

In the clinic for indigents, vaginal pool speci-

mens are used exclusively. A trained nurse, who has had considerable experience in cancer clinics and several years' experience in taking specimens for a cytology laboratory, supervises the personnel who take the specimens.

In the interest of economy and efficiency, non-professional personnel take the specimens. They are supervised directly by the nurse in charge until she is satisfied that they are capable of working under general supervision. These employees also clean and sterilize vaginal pipettes and see that the kits furnished to physicians are equipped with slides, pipettes, and record forms.

These personnel were recruited through local employment sources from a group of intelligent but untrained young women. They were given some background information on genital anatomy and the symptoms of uterine cancer and instruction in the method of obtaining information for the record form, handling of patients, and the technique of obtaining a vaginal smear.

Two senior members of the resident staff of the division of obstetrics and gynecology are responsible for the clinical study of indigent patients with suspicious and positive cytological findings. All patients in this category are seen by these two physicians and are kept under their observation until tissue studies have been completed and a final diagnosis has been established. Patients who have cancer are hospitalized for treatment by the staff of the division. All tissue examinations of these patients are made in the division of pathology and bacteriology of the University of Tennessee. For uniformity of tissue interpretation in connection with the study aspects of the project, other pathologists of the area who examine biopsies from patients found to have suspicious cytology as a result of the project have cooperated by allowing these biopsies to be reviewed.

As the technicians taking specimens became sufficiently experienced, cytology clinics were opened in two other locations in the city where facilities for indigent patients are available. These are largely prenatal and well-baby clinics, and most of the patients are Negroes. The hope was that the publicity given the program would attract well women to the clinics, as well as women attending the other clinics operated in these facilities, but the response has been dis-

appointing. The cytology examinations are largely made on the regular clinic patients and on the relatives and friends who accompany them to the clinic.

### Other Cytology Clinics

Parent-teacher organizations were informed about the project through publicity in the newspapers, over the radio, and through talks given at their regular meetings. Offers were made to open clinics in school buildings at hours which would be convenient for the women interested. A number of clinics were opened on this basis and attendance has been excellent.

In these clinics, each patient is asked for the name of her family physician, and the report of cytology findings is sent to him. If the patient has no physician, she is referred to the Memphis and Shelby County Medical Society for a list of recommended physicians. The results of the examinations are reported to the physician she chooses; no report is ever made directly to the patient.

Industrial organizations are another source of cytology specimens from well women. The management of a number of industries was informed of the nature and purposes of the project, and an offer was made to conduct cytology clinics for female employees. The response to this offer has been gratifying, and many industrial organizations in the study area have had the benefit of this service.

The usual plan for industrial organizations is to have two clinic sessions about 2 weeks apart. At the second session, patients whose examinations were unsatisfactory are reexamined, and women who were menstruating when the first clinic was held have an opportunity to take advantage of the service. Reports are sent to the family physician or to the plant physician, never to the patient.

### Publicity

The mechanics of the cancer case-finding project makes public acceptance and cooperation crucial to its success. The project was initiated with a minimum of general publicity by newspapers and radio, for, with no previous experience in cancer case finding to draw upon,

there was no way of anticipating what the public's response would be. A widespread general response by the 165,000 women in the area who were eligible for the examination would swamp the available facilities. Therefore, it was necessary to work for an even flow of patients on a long-term, continuing basis. Also, to test the flow, processing, and reporting of specimens and reports, a "shakedown" period was considered necessary.

It soon became evident that the public was not overly conscious of cancer as a personal problem, and that more aggressive educational measures were needed. Yet it was necessary that publicity should not antagonize practicing physicians since their cooperation is a necessary part of the project.

The chairman of the policy committee is responsible for the supervision and direction of publicity. Facilities of the university are used to carry on the publicity, and regular announcements and descriptions of the project in local newspapers and on the radio are supplemented by donated space in store windows, billboards, advertising on buses, and pamphlets. Soon after the project began, an exhibit was presented at the local fair. Opportunities are sought to discuss the project before women's organizations and parent-teacher and church groups.

In the beginning, the publicity staff consisted of one full-time person, who devoted most of her time to working with Negro groups. Negro women are less inclined than white women to obtain the cytology examination voluntarily, although they are quite willing to have the examination when they are attending a clinic for another purpose. Added to the staff a few months later was a second person, who had gained considerable experience in public relations in the health field as a result of working with voluntary organizations.

Any apprehension about the public's over-consciousness of cancer has been completely dispelled. Enlightenment and motivation have become the leitmotifs of the publicity program in the effort to reach women individually through every possible medium, until they accept the fact that they can have cervical cancer, and that the cytology examination is a means of detecting this cancer in a curable stage.

## Discussion

Progress of the study of vaginal cytology as a means of finding cases of uterine cancer has been very satisfactory. Only occasionally have the laboratory facilities been taxed to capacity. However, it is doubtful whether the laboratory as presently staffed could maintain the pace required by the original estimate of a maximum of 400 smears a day. Each primary screener can process 25 to 30 slides daily, a laboratory total of about 300, but personnel turnover, need to recruit and train new technicians, illness, and vacations make this potential difficult to meet. Nevertheless, the cytology laboratory has been able to provide the service demanded of it.

A preliminary report on the results of the study has been published elsewhere (2). It is sufficient to say that, in general, in the first 30,000 women examined, 90 percent of the smears have been negative; 6 percent have been unsatisfactory and a repeat examination has been requested; and 4 percent have been recommended for further study. Of these 4 percent, a little less than half have been recommended for biopsy after initial or repeat cytology study. Epithelial changes warranting a diagnosis of carcinoma in situ or invasive carcinoma of the cervix have been found in about half of the biopsy specimens.

Since vaginal smears are used exclusively for initial screening, records of cases of cervical cancer in the Memphis hospitals are checked against the records of the cytology clinic to determine whether these cases were missed by cytology examination. A few such cases have been observed. As a further check, the morbidity survey conducted prior to the beginning of the project is to be repeated (3) and known cases of cervical cancer will be checked against the cytology file to identify additional missed cases.

In a few instances, skeptics have put the cytology program to the test by submitting specimens from known or clinically obvious cases. There are no known instances in which the cytology examination has failed under these circumstances.

As stated earlier, repeat smears from the cervix as well as from the vaginal pool are requested when the original pool specimen cannot be classified as negative. The smear from the



cervix is examined by the technician trained in the examination of cervical specimens, and the new vaginal pool smear is studied by another technician. Each technician makes a report to the chief technician, who studies both report and slides and makes a final evaluation for the review of the pathologist in charge of the laboratory. In this project, cytology is used for screening; it is not competing with the tissue study for relative accuracy in final diagnosis.

Pelvic examinations are not an essential feature of the project. Private physicians use their own discretion in this matter. Indigent patients are not given pelvic examinations but are queried as to symptoms suggestive of cancer. If they have any questionable complaint, they are urged to go to the gynecology clinic without waiting for the report of the cytology findings. If smears contain unexplained microscopic blood, the patient is referred to the gynecology clinic for examination, regardless of the cytological evidence.

Because of staffing and other requirements, it is not feasible at this time to determine minimum costs per examination in this study, but we feel that the cost of cytology examination is not prohibitive when it is compared with the cost of other laboratory procedures. Cost estimates of cytology examination in other studies have ranged from 90 cents (4) to \$3.00 per smear (5), but it is difficult to determine what fixed costs, such as rent, are included in these figures.

Final judgment of the value of vaginal cytology will depend on the following considerations:

1. Can the periodic use of such a simple procedure as vaginal cytology in a population of women result in the diagnosis of cervical cancer sufficiently early so that it will become predominantly a curable disease?

2. Can the interval between examinations be safely extended to more than a year?

3. Will the public accept the cost of finding cancer in a curable stage by this method as a

substitute for prolonged treatment that is often only palliative and all too frequently hopeless?

## Summary

A 3-year cytology screening program for cervical cancer in a general female population was organized in Memphis and Shelby County, Tenn., in 1951 and was put into operation in 1952.

The goals of the study are:

1. To determine whether periodic vaginal exfoliative cytology as a screening procedure can be used to diagnose cancer in the preinvasive stage.

2. To accumulate data for determining age-specific incidence and prevalence rates for both preinvasive and invasive cervical cancer.

3. To estimate the frequency with which vaginal cytology needs to be applied to be effective as a case-finding procedure.

4. To determine whether, through this case-finding procedure, cervical cancer can become largely a curable disease.

## REFERENCES

- (1) Papanicolaou, G. N., and Traut, H. F.: *Diagnosis of uterine cancer by the vaginal smear*. New York, The Commonwealth Fund, 1943.
- (2) Erickson, C. C., Everett, B. E., Siegler, E. E., Whitacre, F., Stirling, J., Dunn, J. E., Graves, L. M., and Sprunt, D. H.: Preliminary report of 20,000 women studied by the vaginal smear technic in a general population. *Proc. Am. Assoc. Cancer Research* 1: 14 (1953).
- (3) Dunn, J. E., Rowan, J. C., Erickson, C. C., and Siegler, E. E.: Uterine cancer morbidity data, Memphis and Shelby County, Tenn., 1950-51. *Pub. Health Rep.* 69: 269-274 (1954).
- (4) Cuyler, W. K., Kaufmann, L. A., Carter, B., Rose, R. A., Thomas, W. L., and Palumbo, L.: Genital cytology in obstetric and gynecologic patients. A four-year study. *Am. J. Obst. & Gynec.* 62: 262-278 (1951).
- (5) Lombard, H. L., Middleton, M., Warren, S., and Gates, O.: Use of the vaginal smear as a screening test. *New England J. Med.* 246: 523-528 (1952).

# National Marriage and Divorce Statistics

—Progress Report, 1945–1955—

By HUGH CARTER, Ph.D.

WITH the increased emphasis on the family, as well as the individual, as a basic unit around which to plan public health activities, the need for statistics on family formation and family dissolution is generally recognized. The consequent increase in the demand for statistics on marriages and divorces has stimulated the development of registration systems, particularly within the last decade.

In general, State departments of health collect, process, and publish the vital statistics of individual States. Location of the State files or indexes of marriages and divorces in the vital statistics offices places the job of handling these records in the hands of persons already skilled in the management of vital records and saves the added overhead costs that would be incurred by establishing separate offices.

## Increase in States With Central Files

The number of areas that maintain central files of marriage and divorce records has steadily increased. This is important since areas that do not maintain such files are not in a position to provide comprehensive statistics. In 1945, 34 areas maintained central files of

marriage records. By the end of 1954, 40 areas—36 States, 3 Territories, and 1 independent city—maintained central files (fig. 1). Divorce records were centrally filed in 23 areas in 1945. At the end of 1954, these records were centrally filed in 34 areas—30 States, 3 Territories, and 1 independent registration area (fig. 2).

In areas with no central files, it is possible to obtain certain data, but these are limited in scope and often incomplete in coverage.

## Standardizing Report Forms

Since 1945, great progress has been made toward standardizing the items of information to be obtained on marriage and divorce report forms. In 1954, the standard record of marriage and the standard record of divorce or annulment prepared by the Public Health Service were formally endorsed by the Public Health Conference on Records and Statistics, a cooperative organization made up of official representatives of the vital registration and public health statistical activities of each State, Territory, and independent registration area. A long period of discussion had preceded this action by conference members (1). The conference also recommended a list of optional items for inclusion on the State report forms to provide data for more intensive study of marriages and divorces.

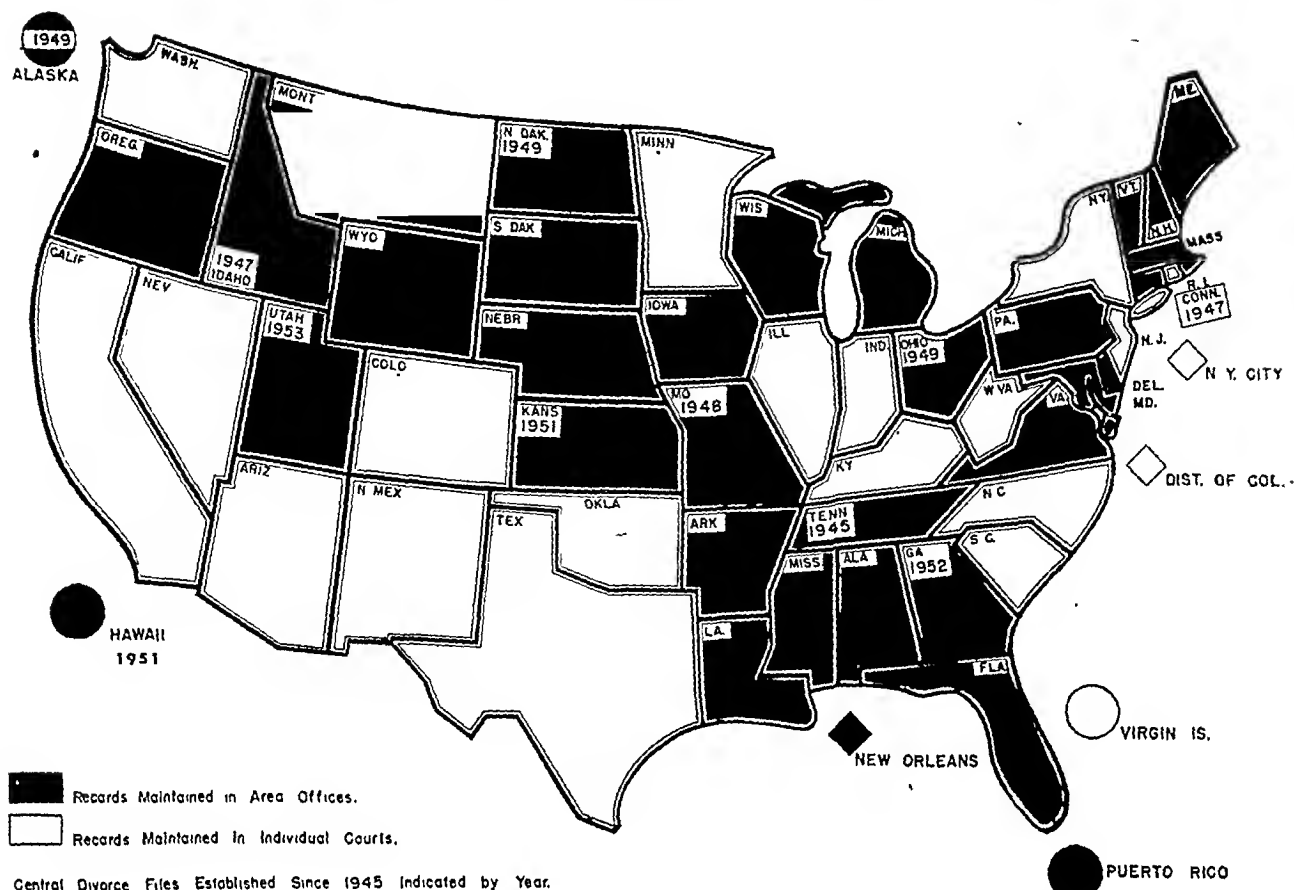
Although some users of marriage and divorce

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Figure 1. Forty areas maintaining centralized marriage records, 1954.



statistics will regret the omission of certain items from the standard record forms, the fact that such forms exist will mean improvement in the comparability and comprehensiveness of the national statistics that become available. The information requested on these forms and the optional items recommended by the working group are listed on pages 350 and 351.

Procedure manuals for use with the standard report forms are being developed by the National Office of Vital Statistics and the State registrars. These manuals will cover definitions of terms; suggested coding, punching, and tabulating instructions; and related matters.

#### Improvement in Available Statistical Data

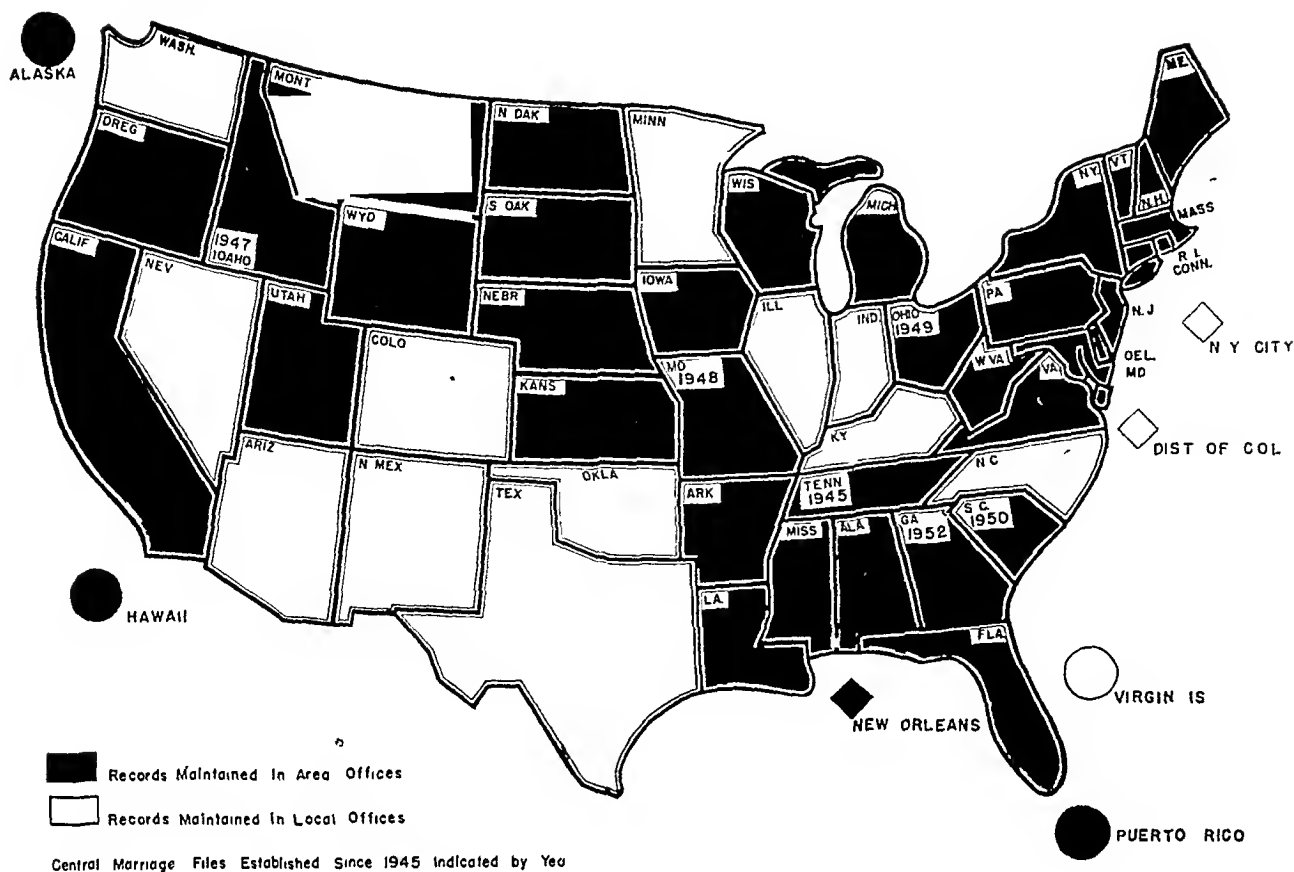
Since 1945, the accuracy of annual statistics of marriages and divorces for the United States has increased. The amount of necessary estimating for missing data from non-reporting areas has been reduced since more comprehensive reports are now received from the States.

Statistics on certain characteristics of persons recently married or divorced are published annually. Reports have been issued for selected areas since 1948 (2-10), and the number of areas providing such statistics has increased. Reports for 1953 have been received from 42 areas, including a few areas which do not have central files.

The data are tabulated according to table outlines distributed annually by the National Office of Vital Statistics. Under this program the cost of obtaining the data is minimal to the Federal Government. However, except for obvious errors and inconsistencies, it is impossible to ascertain the accuracy of the tabulations received from the States. Quality controls are the responsibility of each reporting State.

Monthly statistics of marriages or marriage licenses on a provisional basis have been published since 1944 (11-13). Special tabulations of marriage licenses for cities of over 100,000 population cover data from 1939 (13-16). Monthly statistics on divorces for reporting

Figure 2. Thirty-four areas maintaining centralized divorce records, 1954.



areas began with 1949 data. At that time regular reports were received from 16 areas (12). By 1954 the number of areas reporting divorces each month totaled 30 (13).

National statistics on the social characteristics of persons at the time of marriage are also being compiled on the basis of national sample surveys conducted in cooperation with the Bureau of the Census. The first of these surveys was carried out in 1953 (17) and the second, in 1954. These sample surveys have provided a valuable supplement to the presently incomplete data obtained from registration records. Additional reports will provide data on economic and social characteristics of recently married persons.

#### Plans for the Future

The Working Group on Marriage and Divorce of the Public Health Conference on Records and Statistics has recommended certain steps to improve national marriage and divorce

statistics. These recommendations have been given a vote of approval by the great majority of the members of the conference and are now being implemented as follows:

A registration area for marriage statistics is to be established, effective January 1, 1956. One year later a registration area for divorce statistics will be established. The criteria for admitting a State or an independent registration area to the marriage registration area, and later, to the divorce registration area, have been agreed upon. These include—

1. Central record files for marriages and divorces containing items on the standard record of marriage and standard record of divorce or annulment forms, in the State office.
2. Adoption of report forms of marriage and divorce containing the items on the standard record of marriage and standard record of divorce or annulment forms.
3. Regular reports to the State office by all local areas.
4. Agreement between State office and the

## Information Requested on Standard Record of Marriage

### Items on Form:

County

State file No.

### Application for marriage license:

For both bride and groom—

Name (first, middle, last)

Date of birth (month, day, year)

Usual residence (State, county, city, or town)

Place of birth (State or foreign country)

Previous marital status

Number of previous marriages

Color or race

Usual occupation

Kind of business or industry

Date and signatures of applicants

### Certification:

Date of marriage (month, day, year)

Place of marriage (county, State)

Date of recording

Signature and title of official making return to State health department

### Optional Additional Items Recommended by the Working Group on Marriage and Divorce:

In States receiving original records of marriage, the word "Certificate" may be substituted for "Record."

In addition to "State file No.," provision may be made for "Local file No."

In item for "Usual residence," provision may be made for "Street address or RFD No."

### The following items may be added:

Names of parents

Name or signature, title, and denomination of officiant

Religious preference or denomination of bride and groom

### Possible additional items:

The item "Highest grade of school completed" has merit as an optional item for States that may be interested in the subject, although it was not discussed at the last meeting of the working group.

National Office of Vital Statistics on joint testing of reporting for completeness and accuracy.

The key criterion relates to tests of completeness and accuracy. Agreement is to be reached between the National Office of Vital Statistics and the individual States regarding the tests to be carried out in each State. These tests will aid in locating any imperfections in the reporting system of a given State so that remedial steps may be taken. In the preparation of a working document on tests of completeness and accuracy of marriage reporting, it became evident that the index to State files of marriage records was of crucial importance; consequently, a detailed study of such State indexes is being made. In the fall of 1955, it is planned to provide the Working Group on Marriage and Divorce with data on all States maintaining central files of marriage records and to ask the advice of the working group regarding the States to be admitted to the marriage registration area in January 1956.

A marriage registration test (MRT) in connection with the 1960 census has been proposed by several State registrars. This would parallel the birth registration test (BRT) in 1940 and 1950. This possible project will be explored with officials of the Bureau of the Census. A divorce registration test in 1960 has been suggested.

Further exploration will be made of sample surveys in obtaining useful marriage and divorce data. The results obtained so far are distinctly encouraging.

The needs of the consumers of marriage and divorce statistics will be studied by subcommittees of the United States National Committee on Vital and Health Statistics appointed by the Surgeon General of the Public Health Service. A subcommittee on utilization of marriage statistics is bringing together persons with varied interests to determine the types of information most useful to major consumer groups. It may propose a consumer survey. A similar committee on divorce statistics will be established at a later date. The reports of these two committees will provide a basis for possible modification of the program of marriage and divorce statistics to meet the needs of the consumers.

## Information Requested on Standard Record of Divorce or Annulment

### Items on Form:

County

State file No.

Local file No.

For husband—

Name, (first, middle, last)

For wife—

Maiden name (first, middle, last)

For both husband and wife:

Date of birth (month, day, year)

Usual residence (city, county, State)

Place of birth (State or foreign country)

Number of this marriage

Race or color

Usual occupation

Kind of business or industry

Place of this marriage

Date of marriage (month, day, year)

Number of children under 18

Plaintiff

Decree granted to

Legal grounds for decree

### Optional Additional Items Recommended by the Working Group on Marriage and Divorce:

In States that grant other than absolute divorces, title may include word "Absolute."

In item "Usual residence," provision may be made for "Street address or RFD No."

To item "Number of children under 18" may be added "Number of children born alive this marriage."

To item "Legal grounds for decree" may be added "Number of children to custody of—husband; wife; other (specify)".

To item "Number of this marriage" may be added "Last marriage ended by—death, divorce, annulment."

To item "Place of this marriage" may be added "Date of separation" and "Place of separation."

### Possible additional items:

The item "Highest grade of school completed" has merit as an optional item for States that may be interested in the subject, although it was not discussed at the last meeting of the working group.

### REFERENCES

- (1) Carter, H.: Improving national marriage and divorce statistics. J. Am. Statis. A. 48: 453-461, September 1953.
- (2) U. S. National Office of Vital Statistics: Marriage statistics: Specified States, 1948. Vital Statistics—Special Reports, vol. 35, No. 9. Washington, D. C., U. S. Government Printing Office, 1950.
- (3) U. S. National Office of Vital Statistics: Divorce and annulment statistics: Specified States, 1948, Vital Statistics—Special Reports, vol. 35, No. 12. Washington, D. C., U. S. Government Printing Office, 1950.
- (4) U. S. National Office of Vital Statistics: Statistics on marriages: Specified States, 1949. Vital Statistics—Special Reports, vol. 36, No. 6. Washington, D. C., U. S. Government Printing Office, 1951.
- (5) U. S. National Office of Vital Statistics: Statistics on divorces and annulments: Specified States, 1949. Vital Statistics—Special Reports, vol. 36, No. 7. Washington, D. C., U. S. Government Printing Office, 1951.
- (6) U. S. National Office of Vital Statistics: Statistics on divorces and annulments: Specified States, 1950. Vital Statistics—Special Reports, vol. 37, No. 4. Washington, D. C., U. S. Government Printing Office, 1952.
- (7) U. S. National Office of Vital Statistics: Statistics on marriages: Specified States, 1950. Vital Statistics—Special Reports, vol. 37, No. 5. Washington, D. C., U. S. Government Printing Office, 1952.
- (8) U. S. National Office of Vital Statistics: Statistics on divorces and annulments: Reporting areas, 1951. Vital Statistics—Special Reports, vol. 38, No. 3. Washington, D. C., U. S. Government Printing Office, 1954.
- (9) U. S. National Office of Vital Statistics: Divorce and annulment statistics: Reporting areas, 1952. Vital Statistics—Special Reports, vol. 40, No. 6. Washington, D. C., U. S. Government Printing Office, 1955.
- (10) U. S. National Office of Vital Statistics: Marriage statistics: Reporting areas, 1952. Vital Statistics—Special Reports, vol. 40, No. 7. Washington, D. C., U. S. Government Printing Office, 1955.
- (11) U. S. National Office of Vital Statistics: Marriage licenses issued in the United States, by State, 1944-48. Quarterly marriage report, vols. 1-3. Washington, D. C., U. S. Government Printing Office, 1946-49.
- (12) U. S. National Office of Vital Statistics: Births, deaths, infant deaths, and marriage licenses, 1948-51. Monthly Vital Statistics Bull., vols. 12-14. Washington, D. C., U. S. Government Printing Office, 1949-52.

- (13) U. S. National Office of Vital Statistics: Provisional statistics on births, marriages, and deaths, with data on causes of death and on divorce 1951-54. Monthly Vital Statistics Report, vols. 1-3. Washington, D. C., U. S. Government Printing Office, 1952-55.
- (14) U. S. Bureau of the Census: Marriage licenses issued in cities of 100,000 inhabitants or more, 1939-44. PM-1, No. 4. Washington, D. C., U. S. Government Printing Office, 1945.
- (15) U. S. Bureau of the Census: Marriage licenses issued in cities of 100,000 inhabitants or more, 1943-46. PM-2-PM-4. Washington, D. C., U. S. Government Printing Office, 1944-47.
- (16) U. S. National Office of Vital Statistics: Marriage licenses issued in major cities, 1946-51. Monthly Marriage Report, vols. 1-5. Washington, D. C., U. S. Government Printing Office, 1947-52.
- (17) U. S. National Office of Vital Statistics: Demographic characteristics of recently married persons: United States, April 1953. Vital Statistics—Special Reports, vol. 39, No. 3, Washington, D. C., U. S. Government Printing Office, 1954.

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## PHS Civil Defense Training

The Public Health Service has offered the first of a series of 2-week training courses for physicians and other professional health personnel who would be called to duty in the event of enemy action or other national emergency.

The training courses are a phase of the Service's recently announced emergency program to expand its Commissioned Reserve Corps by 5,000 officers before July 1, 1956.

The course started on March 14, 1955. A second 2-week course is scheduled for May 15. Additional courses will be scheduled later.

Each course covers two main categories: one, the tasks with which a health department staff is generally familiar but for which additional help is required, such as those created by extensive disruption of public facilities and mass displacement of civilians in consequence of enemy action or natural disaster; and, two, the unusual tasks for which new skills as well as additional help may be needed by a health department, such as chemical, biological, and radiological warfare defense, epidemic reporting, monitoring radioactivity, decontamination, and related action.

During the first week, trainees spend 3 days at the Federal Civil Defense Administration Staff College at Olney, Md., on the outskirts of Washington, D. C. There they receive briefing on the strategic aspects of civil defense. The remainder of the period is spent at Public Health Service headquarters in Washington.

Additional information may be obtained from: Chief, Training Branch, Division of Personnel, Public Health Service, Department of Health, Education, and Welfare, Washington 25, D. C.

*Gamma globulin, administered to a group of orthopedically disabled children in a hospital school, failed to prevent or modify measles in a proportion of the cases.*

## Effect of Gamma Globulin on Measles

By OTTO L. BETTAG, M.D., FREDERICK PLOTKE, M.D.,  
and HAROLD M. STERLING, M.D.

THE INCIDENCE of complications with or following measles has led to various attempts at modification or prevention (1, 2). At present, the use of gamma globulin is considered the most effective means of preventing measles (3, 4). Since it is important in some instances to prevent this illness and in others to modify it, much effort has been directed recently toward establishing an optimum dosage (5, 6).

Current recommendations call for the administration of gamma globulin by the intramuscular route in a dosage of approximately 0.02 cc. per pound of body weight for modification and of 0.1 cc. per pound of body weight for prevention of measles (7-9). At least one worker has presented evidence that 0.02 cc. per pound of body weight is excessive since this "modifying" dosage frequently appears to prevent the disease completely (10).

The effectiveness of gamma globulin in preventing or modifying the course of measles was studied during an epidemic in the spring of 1954 at the Illinois Children's Hospital School, Chicago.

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*Dr. Bettag is director of the Illinois Department of Public Welfare, and Dr. Plotke is chief of the department's public health service. Dr. Sterling is medical director of the Illinois Children's Hospital School, Chicago.*

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The study included 92 permanent resident children at this institution. At the time of this report, the shortest period of residency in this hospital school was 2 and the longest 8 years.

The diagnostic categories included 35 children with cerebral palsy, 26 children with residual paralysis following poliomyelitis, 5 children with paraplegia following trauma, 2 children with paraplegia following transverse myelitis, 3 with paraplegia due to spina bifida, 5 with muscular dystrophy, and 16 with other disorders. The children in general represented the more severe forms of these conditions. Approximately one-third of the students are almost or totally helpless. In this latter group illness of any kind or complications thereof would be serious.

The review of the status of the children at the time of this study showed that of the 92 children, 16 had no history of exanthemata; 66 had a definite history, and 10 had a questionable history of measles (table 1).

The age range for the group was 5 to 20 years. The average age was 12 years; 82 were white, and 10 were Negroes; 52 were males and 40 females. The patients were observed under the condition of this study from March 1, 1954, to May 15, 1954.

For the study the children were divided into three groups:

Group 1 comprised 58 children in good physical condition who had a positive history of



**Table 1. Immunity status of 92 children according to diagnosis**

Diagnosis	Number of patients	History of previous measles	Questionable history of previous measles
Brain injury (cerebral palsy)-----	35	25	2
Postpoliomyelitis-----	26	23	0
Paraplegia-----	10	8	2
Muscular dystrophy-----	5	3	2
Other-----	16	7	4
Total-----	92	66	10

measles. These children were considered immune, and gamma globulin was not administered to them (11).

Group 2 consisted of 24 children in good physical condition who by history were considered susceptible. "Modifying" doses of gamma globulin were given to this group (12).

Group 3 included 10 children for whom measles, or its complications, was considered dangerous. This group was protected by the administration of "preventive" doses of gamma globulin, irrespective of a previous history of measles.

Group 3 consisted of:

Two students with previous history of measles, both manifesting severe respiratory difficulties following paralytic poliomyelitis.

Two students with indefinite history of measles; both had progressive central nervous system degenerative disease.

Six students with no history of measles—3 severe dystonic athetoid cerebral palsy cases, 2 muscular dystrophy cases, and 1 spastic paraplegia case with primary tuberculous infection.

The first case of measles in this epidemic developed March 5, 1954, in a child who was isolated in his room from the onset of the symptoms (except for part of one day) 3 days prior to the appearance of a rash. It was later learned that during a visit with relatives he was in contact with a child who subsequently developed measles. Immediately after the rash appeared in this first case, the child's entire residential floor was quarantined in an attempt to prevent the spread of the disease. Gamma globulin was administered to all those for whom it was indi-

cated on the fourth day of probable exposure.

During the following week several new measles cases appeared, but none occurred on the residential floor originally quarantined. As soon as the new cases were diagnosed, the 24 students in group 2 presumed susceptible because of no known previous attacks of measles were moved to a single residential floor. The group 1 students with natural immunity and the group 3 children with immunity passively conferred by gamma globulin continued as usual their activities of school, treatment, and home visits. For those quarantined, schooling and the various types of treatment were carried on in their quarters.

Six of the ten students in group 3 subsequently developed measles. One had an onset 11 days, two 12 days, one 17, one 18, and one 38 days after gamma globulin administration. Four children had mild and 2 had moderate cases. There were no significant sequelae to the infection. Thus, of the 10 persons for whom measles was presumed to be dangerous, 6 contracted the disease in spite of administration of the accepted "protective" dose.

The 2 children afflicted with moderate cases of measles also developed German measles 30 and 45 days, respectively, after the onset of their measles. Two others who did not have measles developed German measles approxi-

**Table 2. The effect of preventive doses of gamma globulin according to disease category**

Diagnosis	Number of patients receiving preventive dose of gamma globulin	Number of patients receiving gamma globulin and subsequently developing measles	Percentage of patients developing measles
Brain injury-----	3	1	33
Postpoliomyelitis-----	2	1	50
Muscular dystrophy-----	2	2	100
Other:			
Pelizaeus-Merzbacher-----	1	0	0
Amyotonia congenita-----	1	1	100
Congenital lower motor paralysis, unknown etiology--	1	1	100
Total-----	10	6	60

mately 6 weeks after gamma globulin administration. One of these students, with progressive central nervous system degeneration (Pelizaeus-Merzbacher syndrome), appeared to deteriorate rapidly following relatively mild German measles.

A breakdown of patients developing measles after a "protective" dose of gamma globulin given at least 11 days prior to onset of symptoms is shown in table 2. The gamma globulin failures were distributed among a wide range of degenerative diseases.

Of the 24 students who received "modifying" doses of gamma globulin, 19 developed measles, and in 8 of these German measles developed subsequently. Four of the 19 had severe cases of measles and 4 others had complications of some sort.

Of the 58 students with positive histories of measles, 20 students developed measles, 4 German measles, and 3 had both. Three had some type of complications.

### Summary and Conclusions

An epidemic of measles followed by an epidemic of German measles occurred in a residence school for 92 orthopedically disabled children, 16 having no previous history of exanthemata. The possibility of progression of basic conditions or of seriousness of sequelae prompted an attempt to prevent the disease in 10 pupils by the administration of 0.1 cc. gamma globulin per pound of body weight intramuscularly on the fourth day after exposure; 24 others received 0.02 cc. per pound of body weight to modify the illness; 58 students, who had positive histories of measles, received no gamma globulin and, therefore, were not quarantined.

Six children developed measles at least 11 days after receiving a "preventive" dose of gamma globulin. Of these, 4 had mild and 2 had moderate measles, but none had complications from this disease. One child suffered rapid progression of the basic condition following a subsequent attack of German measles.

A previous history of measles was of no value

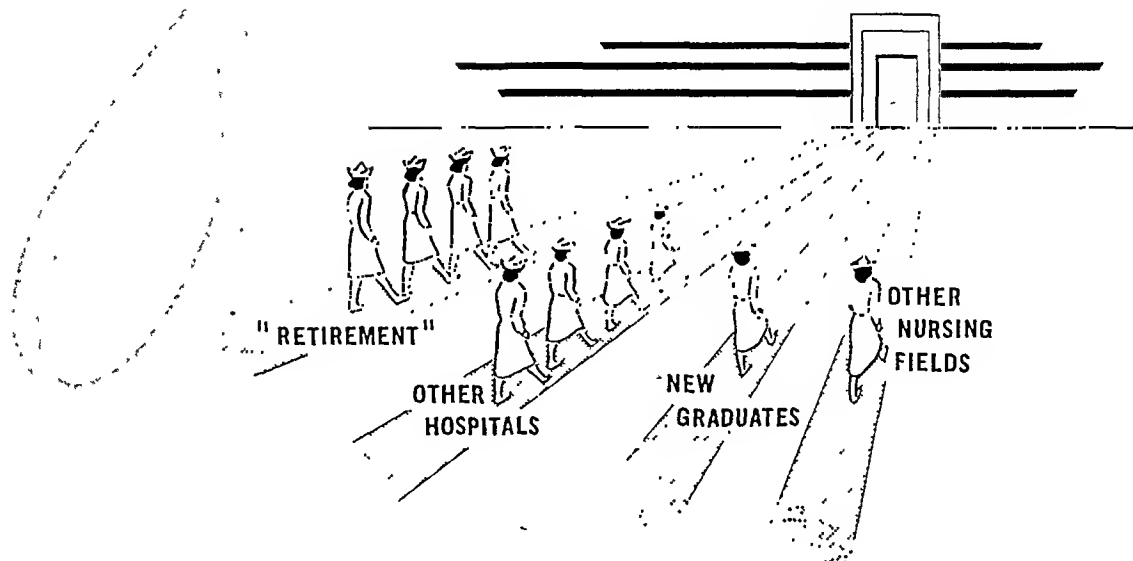
in deciding who should receive gamma globulin, since 20 students with such histories developed measles, 4 German measles, and 3 both. Three had complications of some type.

Gamma globulin in the dosage currently recommended for prevention of measles failed to protect 6 out of 10 children to whom it was administered. Gamma globulin in "modifying" dosage apparently failed to modify the disease in 4 out of 19 students to whom this dosage was administered. There was no evidence that gamma globulin prevented or modified German measles.

### REFERENCES

- (1) McKhann, C. F.: The prevention and modification of measles. *J. A. M. A.* 109: 2034-2038 (1937).
- (2) Sweet, C.: Measles: Its prophylactic treatment with blood of immune persons. *California & West. Med.* 38: 254-260 (1933).
- (3) Ordman, C. W., Jennings, C. G., Jr., and Janeway, C. A.: Use of concentrated human serum gamma globulin in prevention and attenuation of measles. *J. Clin. Investigation* 23: 541 (1944).
- (4) Janeway, C. A.: Clinical use of products of human plasma fractionation. *J. A. M. A.* 126: 674-680 (1944).
- (5) Greenberg, M., Frank, S., and Rutstein, D. D.: Gamma globulin and placental globulin. *J. A. M. A.* 126: 944-947 (1944).
- (6) Mele, L.: Prophylaxis against measles with gamma globulin in fifteen thousand subjects, treated frequently. *Minerva pediat.* 2: 591 (1950).
- (7) Cathala, J., and Straus, P.: Prevention de la rougeole par la gamma globuline. *Arch. franc. pédiat.* 9: 881-885 (1952).
- (8) Coigny, R. L., and Straus, P.: Epidemiological study of measles as influenced by mass immunizations. *Presse Méd.* 59: 634 (1951).
- (9) Christensen, P. E., and Schmidt, H.: An epidemic of measles in southern Greenland, 1951. IV. Significance of specific prophylaxis. *Acta med. Scandinav.* 145: 126-142 (1953).
- (10) Bivings, L.: Gamma globulin dosage and measles control. *J. Pediat.* 43: 401-403 (1953).
- (11) Thamdrup, E.: Reinfection with measles. *Acta paediat.* 41: 276-282 (1952).
- (12) Karelitz, S.: Does modified measles result in lasting immunity? *J. Pediat.* 36: 697-703 (1950).

# Sources of Nurse Supply New Hospitals



By EUGENE LEVINE, M.P.A., MAURICE E. ODOROFF, M.A., MARGARET G. ARNSTEIN, R.N., M.P.H.,  
and JOHN W. CRONIN, M.D.

THE OPENING of new hospitals in communities which formerly had none is attracting many nurses back to their profession. In 388 small communities that have built new hospitals since 1946 under the Hospital Survey and Construction Program, 2 of every 5 professional nurses employed on the staffs have come

back to work from "retirement." This is one of the findings uncovered in a survey of nurses employed in these hospitals.

The survey was undertaken because the existing shortage of nurses raised questions about the sources of nurse supply for new hospitals. There were some indications that nurses were attracted back to their profession because hospitals were built where none existed before.

Two years ago in Texas, the hospital survey and construction division of the Texas State Department of Health found that 1 of 5 professional nurses employed in Hill-Burton hospitals in the State had been inactive before their employment (1). This finding raised the question of what was happening on a nationwide

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basis. The Public Health Service, through the Division of Nursing Resources and the Division of Hospital Facilities, designed a study to answer the following questions:

Are the new hospitals recruiting many members of their nursing staffs out of retirement?

Why do nurses take jobs in these hospitals?

How do nurses find out about the vacancies?

How well staffed are the nursing services?

### How the PHS Study Was Conducted

Questionnaires were sent in May 1954 to 516 hospitals—388 new Hill-Burton hospitals and 128 hospitals established before the Hill-Burton program began. (The Hospital Survey and Construction Act was passed in 1946, Public Law 725, 79th Cong., 2d Sess.; and the first hospital was opened on October 15, 1948.) The latter hospitals, similar in location, size, and type to the Hill-Burton group, served as a control group and formed a basis for evaluating findings from the new hospitals.

The individual nurses filled out the questionnaires, and the hospitals provided data on bed capacity, patient census, staffing, and vacancies. One or more forms were received from 403 hospitals in 36 States.

Returns by type of hospital were as follows:

	<i>All hospitals</i>	<i>New</i>	<i>Older</i>
Number of hospitals where nurses received forms---	516	388	128
Number of hospitals returning 1 or more forms--	403	322	81
Percentage returns-----	78.1	83.0	63.3

A total of 2,311 professional nurses in the new hospitals and 634 in the older group participated in this study. These participants represent two-thirds of the nurse staff of the new group and three-fifths of the nurse staff of the older group. The results of this study are considered reliable because of the large proportion of hospitals and nurses who responded.

### Staffing Patterns

Three characteristics distinguish the 403 hospitals that participated in the survey:

## Staffing the New Hospital

This recent study of recruitment of 2,311 professional nurses in new Hill-Burton rural hospitals and a control group of 634 nurses in 81 hospitals built before the Hospital Survey and Construction Program began in 1948 reveals the following facts: ▶Two out of every five nurses employed in rural hospitals (old and new) were previously housewives and thus retired from the nursing profession. New rural hospitals, by creating employment opportunities where none existed before, are attracting back to work many nurses who probably would have remained permanently inactive professionally.

▶The new Hill-Burton hospitals have fewer professional nurses per patient than the average hospital in the United States. However, they have so many more nonprofessional nurses that the total number of nurses per patient is higher.

▶Fifteen percent of the professional nurse positions in the new hospitals are vacant. There is some evidence in the survey that these hospitals have a fairly high turnover rate—although probably no higher than other hospitals.

▶Many nurses who previously were working in hospitals in other localities came to work in new hospitals because they could return to their home towns to live. Most inactive nurses returned to work in order to help relieve the nursing shortage or to assist with the financial upkeep of their families.

▶The best way to recruit new nursing personnel is by personal contact. Hospitals can help solve staffing problems by keeping good relations with their own employees and with the public.

They are small—97 percent of both these new and older hospitals have less than 100 beds (table 1) compared with 66 percent in the country as a whole.

They are the only hospital facilities serving areas where they are located.

They are located in towns serving semi-rural and rural areas—the majority in towns of less than 5,000 people (table 1).

Because of these characteristics, the problems of recruiting nurses in these hospitals are different from those in large cities. Surveys of nursing needs and resources in various States during the last few years have indicated that

*Many physicians have served in Samoa, but few have written about the health problems of these enchanting islands.*

# Notes on Public Health in American Samoa

By EDWARD KUPKA, M.D., M.P.H.

AMERICAN SAMOA is the only United States possession south of the Equator. Just within the southern limit of the Torrid Zone and south of Hawaii, it comprises the smaller eastern end of an archipelago of islands, the western end being a New Zealand trust territory, and formerly a German possession.

American Samoa is made up of seven islands, chiefly Tutuila and the three small islands known as the Manua group. The inhabitants are Polynesians, of the same race and with almost the same language as Tahitians, the Tongans, and the Hawaiians. In number 18,000, these people live on the narrow rims of the islands, between the volcanic mountains that cover most of the area and the beaches.

The island economy is agricultural. The Samoans cultivate taro, breadfruit, and coconut. They catch shellfish and fish and raise pigs and chickens. Several or many families

form a village, presided over by village elders and an elected chief. The primary loyalty of each Samoan is to his village, which gives him complete security in exchange for his work and faithfulness.

The Samoans are Christians, although their religion incorporates some of the rudiments of their earlier beliefs. Their manner of life has changed little since Margaret Mead wrote her famous "Coming of Age in Samoa" three decades ago.

## Under Navy Administration at First

When the United States Government, at the request of the chiefs of eastern Samoa, and as part of a treaty arrangement with England and Germany, took over the sponsorship and the protection of the islands at the end of the 19th century, the task of administration was given to the Department of the Navy. A high-ranking naval officer was selected as Governor, assisted by a staff of Navy administrative and technical personnel.

A legal code, which combined basic American law with a respectful regard for Samoan custom, was adopted, and a strong legislative body composed of all the senior chiefs was established. Roads were built, utilities created, and homes, offices, workshops, and warehouses were erected.

The harbor at Pago Pago, considered one of the best in the world and made known to literature by Somerset Maugham's "Rain," became

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the site of a naval base. During World War II, Tutuila was a Marine base, and scores of thousands of Americans were temporary residents there.

In 1951, by Presidential decree, the Navy closed the base, and the Department of the Interior was given administrative responsibility for American Samoa and for the Trust Territory of the Pacific Islands.

Since then, the Governor of American Samoa and his administrative and technical employees have been civilians, and usually American citizens. Samoans themselves are assuming more and more of the governmental positions as they acquire the necessary training, particularly in the field of teaching.

### **The Public Health Structure**

The Government departments are six: administration, justice, public works, Samoan affairs, education, and public health.

The Public Health Department is responsible for both preventive and curative activities.

The department's medical staff comprises a chief, a deputy (whose special functions are in the field of preventive medicine and the supervision of the district dispensaries), a surgeon, an internist, a pediatrician, and a tuberculosis specialist.

Staff members are usually Americans, although physicians educated in Europe have also been employed.

The nursing staff consists of a chief, the head of the nursing school, a public health nurse, and a tuberculosis head nurse. These positions are provided in the organization plan but are frequently vacant because of recruitment difficulties, so that doubling up of functions is common. (The same applies to the physician staff.) The duty period is 2 years.

There is a much larger cadre of Samoan physicians and nurses. The 12 Samoan physicians have the degree S.M.P., the abbreviation for Samoan medical practitioner. They are not considered fully trained physicians at graduation by our standards; their training was received either at the Suva Medical School in the Fiji Islands or at a similar institution which the Navy maintained for a time at Guam.

Promising young men from the various is-

lands of the South Pacific who speak some English are given a training which enables them to do simple medical practice. Some, by later serving for long periods under American physicians, become highly experienced and can be entrusted with major responsibilities.

Eight of the Samoan medical practitioners are at the Government of American Samoa Hospital, each in charge of a ward or clinic. The others serve in the four district dispensaries. During their early years they are rotated through the various services in order to give them broad experience.

The Samoan medical practitioners relieve the physicians of many of the routine duties: They take histories, perform and record physical examinations, and make progress notes. They write routine orders and keep the outpatient clinic records. They screen night calls and see to routine matters.

A Samoan medical practitioner is at the side of the physician most of the time, not only for his own training, but to give assistance and to act as translator since few of the patients speak English.

Including active graduates and present students, there are about 100 Samoan nurses who were all trained at the hospital and given the degree of S.N., which stands for Samoan nurse. The chief Samoan nurse was a member of the first graduating class almost 40 years ago.

Samoan nurses are carefully chosen Samoan women; they receive 4 years of training under Samoan and American nurses, somewhat comparable to the 3-year basic training in the United States, but with less academic and more practical training, rotating through all the services. Many marry and are lost as full-time nurses, but they remain a force for health education in the villages to which they return.

All physicians and nurses are government employees and enjoy high prestige. Nursing is about the only profession that a Samoan woman is permitted by her culture to enter. In the social scale, the Samoan physicians rank next to the chiefs and the pastors.

The Government of American Samoa Hospital is located on the west shore of Pago Pago Bay, on filled land, a scant half mile from the governmental offices and population center. It was built after World War II by uniting wooden

2-story military barracks in series, and putting the main service, administrative, and clinic functions into a new central concrete section.

The hospital can accommodate 250 patients. The largest number of occupied beds is for tuberculosis patients; next in order are those for pediatrics, surgery, medicine, and obstetric patients.

A small building separate from the hospital houses the leprosarium.

The Samoan nurses in residence live in remodeled barracks in front of the hospital, and the American employees live in cottages along the edge of the bay, a few hundred feet away.

The curve of foothills around the hospital grounds, heavily wooded, almost hides Utulei, one of the largest of the island's villages, where many of the Samoan employees live.

The district dispensaries were first established by the Navy and operated by pharmacist mates. They are located at outlying centers of population. Two are on the Manua Islands, 80 miles from Tutuila, and are connected by radio and by government steamer, which makes scheduled and emergency trips.

The larger of the dispensaries has a 10-bed hospital and the most experienced of all the Samoan medical practitioners.

Each dispensary is well supplied with drugs and first aid equipment, 1 or 2 beds for urgent care or deliveries, a minor surgery, and staffed by a Samoan medical practitioner and 2 or more district nurses. The dispensaries give first aid, treat minor illnesses, and perform normal deliveries. More serious cases and most major surgery are sent to the hospital.

With this staff and medical plant, the general and special medical and public health functions are conducted in a conscientious and thoroughgoing manner. The Samoan medical system ranks high among those of the Pacific Islands. The pioneering efforts of many Americans, Navy and civilian, contributed much, but the major factor in the success of the system was the intelligence and cooperation of the Samoans themselves.

### No Malaria, No Syphilis

In approaching the special disease problems of the islands—all in the field of transmissible

diseases—one should first note that there have never been recorded any cases of malaria or syphilis although these diseases are common elsewhere in the South Pacific.

The absence of a suitable vector explains the freedom from malaria. Freedom from syphilis has been alleged to be due to the fact that most Samoans have had an episode of yaws early in life.

Yaws is a common problem but no longer a serious one because of the effectiveness of treatment in the early stages.

The Navy established yaws teams which went from village to village, treating everyone with lesions or suspected lesions of the skin. Arsenicals were used at first, and later penicillin. Severe lesions of active destructive yaws are rarely seen today.

Traveling teams are not now used, but dispensary nurses in their work in the villages find the yaws cases and send them to the hospital for treatment or treat them on the spot.

Intestinal parasitic infestation is almost universal after early childhood. Routine stool examinations were formerly made at the hospital, but since most of the patients were found to be positive for one or, more commonly, several parasites, this examination is now done only when especially indicated.

The Samoans tolerate their parasites well. *Ascaris* and *Trichuris* are the most common. *Ancylostoma* is of moderate frequency. Because they may play a secondary role along with malnutrition, in the serious pneumonias of early childhood, "deworming" clinics are held for children of all ages regularly at the beginning of each school semester.

The Government of American Samoa has been sending patients with leprosy to Makogai in the Fiji Islands where there is an excellent large leprosarium. The sufferers from Hansen's disease are thus sent 800 miles from home, and many, at least in the past, never return. This circumstance makes persons with the disease reluctant to seek treatment.

Although the Makogai institution is pleasantly located, and well run, with up-to-date treatment, and the Samoans carry on their own village life there, separated from the Fijis, the love of their own islands and villages at home is

strong, and they understandably do not want to go away.

About 40 American Samoans are at Makogai (pronounced *Makognai*). The reluctance of the others to seek treatment has been partially remedied by the building of a 10-bed leprosarium behind the Government of American Samoa Hospital, for isolation, observation, and initial treatment. The present plan is to enlarge the leprosarium or to build a small colony nearby for all of the leprosy patients on Tutuila. With modern drugs and ambulant treatment, a small unit may suffice.

### Filariasis and Tuberculosis

The two chief transmissible diseases are filariasis, and that special plague of the South Sea Islanders, tuberculosis. Acute bacterial pneumonia is the chief cause of death among the Samoans.

Filariasis, which was of considerable importance among military men stationed in many of the South Sea Islands during World War II, is a common and serious disease, though fortunately its chief sequela, elephantiasis, is rapidly decreasing in prevalence. Elephantiasis results from repeated exposure over a long period of time.

The parasite causing filariasis is *Wuchereria bancrofti*. The vector is *Aedes polynesiensis* (until recently called *Aedes pseudoscutellaris*), which inhabits the bush only and has a very limited flight range, so that the disease is not contracted in the villages. Since, however, a staple food on the island is taro root, much of which is cultivated in the bush, the Samoans, particularly the men, are exposed.

A special filariasis clinic is held weekly at the hospital. Hetrazan is fairly effective against microfilaria, and courses of this therapy are given to patients and suspects. Surgery is sometimes necessary for the disfiguring end effects, especially for filarial hydrocele.

Control of the vector mosquitoes is difficult. Special attention to this problem is being given in Tahiti, where the disease is even more serious, by a research institute for tropical diseases under the leadership of Dr. John Kessel of the University of California at Los Angeles.

Tuberculosis is the second leading cause of

death and is the chief public health problem. Almost half the bed capacity of the hospital is used for the treatment of tuberculosis. An aggressive case-finding program was put into effect in the last 2 years, with routine chest films of all hospital admissions, a weekly chest clinic, and tuberculin testing of high school students and other groups.

As in many Pacific islands, tuberculosis became a veritable acute plague after its introduction in Samoa by Europeans more than a hundred years ago, with the coming of the first missionaries. The verbal traditions handed down from those days describe the severity of the epidemic.

Today, the Samoan seems to have traveled well along the road toward increased immunity. The acute forms of tuberculosis are now not often seen, except for tuberculous meningitis in young children. As in the continental United States, the usual forms found are the pulmonary exudative-fibrotic and fibro-caseo-cavitary varieties. Scrofula in children still occurs.

Minor collapse measures and antibiotic therapy were introduced by the Navy and intensified during the past 2 years. Thoracic surgery is a present lack, and the possibility of using a visiting thoracic surgeon should be further explored. Thoracoplasty and excisional surgery will help clear the beds now occupied by some who otherwise will not be able to be rid of their cavities and who therefore continue to be infectious.

The enthusiastic cooperation of the Samoan is of great value in the control of tuberculosis: He reports early for treatment of symptoms; he is cooperative and quite content to stay in the hospital until discharged.

In 1952 the death rate from tuberculosis among American Samoans was about 80 per 100,000. This figure is probably a minimum, for some, not many, undiagnosed tuberculosis deaths occur in the villages.

Young adults and young women especially are the most affected age and sex group. The current tuberculosis picture may be likened to that found in the United States 30 years ago. Although the resources of the hospital are being strained by the large number of cases of tuberculosis found in the last 2 years, the prospect of effective control in the near future is good.



cases of tuberculosis, their contacts, and also the tuberculosis suspects who have been referred to private physicians by the countywide survey and who have not as yet had decisions regarding the presence of active tuberculosis. The contact programs are scheduled, usually, to take place in counties in which countywide surveys were held the preceding year.

In addition to these two types of programs, X-ray surveys of special groups are carried on throughout the year. These are directed toward county homes and other institutions, to groups of food handlers, to industries, to colleges or other schools, and to small communities not covered by countywide surveys. In some instances the special program consists of 70-mm. film screening only, from which suspects are referred to private physicians for repeat X-rays. In other special groups, such as county homes and State and county institutions, suspects on the 70-mm. film are X-rayed again by the State health department units as is done in the countywide survey and the contact programs.

The 5 mobile units participating in these 3 programs are equipped to take both 70-mm. and 14" x 17" films. Three of the units are owned by the Iowa State Department of Health, and 2 are owned by the Iowa State Tuberculosis and Health Association.

### The Countywide Survey

The countywide survey generally consists of a large-scale appeal to people to accept an X-ray of the chest. An attempt is made to get an X-ray schedule into every home in the county, and, in addition, many persons are X-rayed at their place of work. School children, beginning with the seventh grade, are also included in this program. Persons who are positive to the 70-mm. X-ray are urged to return at a specified time for a 14" x 17" plate. All persons with suspected "tuberculous pathology" are referred to their physicians for confirmation of the diagnosis.

During 1952, surveys were held in 19 counties with an estimated total eligible (15 years and over) population of 293,327. Chest X-rays were performed for 222,441 (75.8 percent) persons. Of this number, 220,409 (99.1 percent)

**Table 1. Results of the countywide chest X-ray surveys, 19 Iowa counties, 1952**

Survey findings	Number	Percent
<i>Film data</i>		
Total 70-mm. films taken-----	222,441	100.0
Not recalled for 14" x 17" films-----	220,409	99.1
Recalled for 14" x 17" films <sup>1</sup> -----	2,032	.9
Total large films taken-----	1,790	100.0
Essentially negative-----	493	27.5
Positive "pathology"-----	1,297	72.5
Tuberculosis-----	384	21.5
No tuberculosis-----	913	51.0
<i>Referrals and confirmed diagnoses</i>		
Total tuberculosis suspects (14" x 17" films)-----	384	100.0
Reported before survey-----	96	25.0
Primary complex <sup>2</sup> -----	35	9.1
Referred for followup-----	253	65.9
Tuberculosis diagnoses confirmed <sup>3</sup> -----	110	100.0
Active-----	16	14.5
Questionably active-----	12	10.9
Inactive-----	77	70.0
Activity not stated-----	5	4.5

<sup>1</sup> 242, or 12 percent of 2,032, did not return.

<sup>2</sup> Not reportable.

<sup>3</sup> As of Oct. 1, 1953; represents 43.5 percent of 253.

were not recalled for a 14" x 17" film, and 2,032 (0.9 percent) were recalled for further examination (table 1).

This unusually low percentage of persons recalled for a large film may be partially explained by the fact that persons with readings of suspected nontuberculous chest diseases, with the exception of neoplasm, were not recalled for 14" x 17" films.

It was not considered necessary to recall for a large film those persons suspected from the reading of the 70-mm. film of having cardiovascular abnormalities and other conditions such as thoracic cage anomaly, lung anomaly, and abnormal diaphragm. Instead the film interpretation was reported by letter to the person's physician, and the individual was notified to see him for a report of the X-ray findings.

Of the 2,032 persons recalled for a 14" x 17" film, 1,790 received that type of X-ray, approximately one-fourth (493) were considered essentially negative, and one-fourth (384) as having tuberculosis (see table 1). The remainder, approximately 50 percent, were described as having findings other than tubercu-

losis—findings such as pneumonitis, possible neoplasm, emphysema, and hilar node calcification. Two hundred forty-two persons had confirmatory films taken privately, or did not live in the area, or had moved away.

Of the 384 persons who were considered tuberculosis suspects on the 14" x 17" film, 131 are described as previously known to the health department or not reportable (primary complex). The remaining 253, or approximately 1 per 1,000 persons examined, were referred to the physicians for followup and confirmation of diagnosis of tuberculosis. Among the replies from physicians and among the morbidity reports submitted by physicians, which were matched against the results of the X-ray, were 28 cases of active or questionably active tuberculosis which can definitely be ascribed to the survey as the case-finding mechanism. This is approximately 1 case per 8,000 persons examined.

Toward the end of 1952, queries were mailed from the State health department to physicians who had failed to report on cases referred to them from countywide and contact programs. Queries were sent on 281 cases; 125 answers were received as follows:

Seventy-five stated that patients had reported, were under physicians' care, but did not confirm the diagnosis of tuberculosis.

Ten confirmed the diagnosis.

Forty replied that the patients had not reported to them.

One hundred and fifty-one did not reply. Second letters were not sent to these persons. It appears likely that more cases of tuberculosis existed than were reported on by the physicians.

### The Contact Program

In preparation for a county contact program, records of reported cases or suspects in the county and all information regarding contacts of patients, including the results of previous X-ray readings, are sent by the State health department to the nurse who is to work in the county.

The nurse visits all physicians in the county and obtains their permission to call on cases, contacts, and suspects. She also asks the physician for the names of any persons on his patient

roster who may be suspected of having tuberculosis or for whom he feels an X-ray of the chest would be advisable. The X-ray in this program is a 14" x 17" film since it is considered more of a diagnostic procedure than a screening procedure.

Tuberculin testing of contacts and suspects before the survey is recommended, and the physician is supplied with sufficient tuberculin for this purpose. Some physicians prefer to have their patients receive the 14" x 17" X-ray without prior tuberculin testing.

The results of this program for 1952 are shown in table 2. A total of 2,234 persons received a large film. Of these, over half (53.3 percent) had positive readings; 714 were positive for nontuberculous pathology; and 477 were suspected of having tuberculosis. Most of these persons had previously been reported as having tuberculosis, and of those referred to physicians for diagnosis, 11 were reported as new active cases of tuberculosis.

### Special Group Surveys

Special X-ray programs in 1952 consisted only of the 70-mm. X-raying or screening phase. The names of persons with positive results at screening were referred to private physicians with recommendations for a large film. Records of the results of followup of suspects are not available.

In some programs, such as those conducted in county homes or in mental institutions, all persons with positive 70-mm. X-rays were re-

**Table 2. Results of contact followup program, 44 Iowa counties, 1952**

Results	Number	Percent
Persons receiving 14" x 17" films.....	2, 234	100. 0
Negative readings.....	1, 043	46. 7
Positive readings.....	1, 191	53. 3
No tuberculosis.....	714	31. 8
Tuberculosis.....	477	21. 4
Previously reported.....	320	
Primary complex.....	16	
Referred to physicians.....	141	
Diagnosis confirmed.....	61	
Active and questionably active.....	11	
Inactive.....	41	
Not stated.....	9	

called to have 14" x 17" films taken. In programs in which recall was included (county homes and the mental institutions), approximately 10 percent of those receiving 70-mm. X-rays were recalled to have the large films taken.

Two active cases of tuberculosis never previously known were discovered by this project. This is approximately 1 active case for each 1,500 70-mm. X-rays taken on persons in county homes and mental institutions. Undoubtedly, these 2 active cases are not the only ones discovered as a result of this survey since approximately only one-third of the 70-mm. films were subject to recall, two-thirds of the suspects had been referred to physicians on the basis of the 70-mm. X-ray, and no record of followup for these groups is available in the State health department.

Tuberculin testing of special groups has been developed and conducted as a special program in case finding. Entire school populations, usually limited to the seventh grade and over, have been tuberculin tested in some areas, and in other areas just selected grades have been tested. All those having positive reactions are X-rayed, and their associates are also examined for the presence of tuberculosis.

We see then that within the limits of reporting by physicians on the results of their follow-

up there were discovered through all these State programs at least 184 new cases of tuberculosis, of which 41 were active or questionably active. It is likely that some cases of tuberculosis diagnosed were not reported back by physicians, and among the 126 cases described as inactive, continued examination will show some to be active.

The 41 active cases may be considered the minimum accomplishment of the case-finding program. It is interesting that these 41 active cases are approximately 8 percent of all the cases of active tuberculosis reported in Iowa during 1952.

We may generalize that at least 8 percent of all the active tuberculosis discovered in the State of Iowa during 1952 was discovered as a result of these statewide case-finding efforts.

### Another Approach

Analyzing the reasons for coming to diagnosis is another way to examine our case-finding program and, of course, is a different approach from the one previously described.

In this analysis we start with the cases diagnosed as having tuberculosis or with the cases admitted to a sanatorium. Then through a retrospective study we attempt to find out what were the reasons which led to the diagnosis of

**Table 3. Reason for coming to diagnosis—patients admitted to Oakdale Sanatorium, Iowa, with active tuberculosis, 1952**

Stage on admission	Symptoms		Contact investigation		X-ray survey		Hospital admission X-ray		X-ray by nurse		Followup of inactive tuberculosis		Other		Total	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Minimal.....	3	30	3	30	1	10	0	0	2	20	1	10	0	0	10	100
Moderately advanced.....	25	51	5	10	8	17	4	8	1	2	4	8	1	2	48	100
Far advanced.....	101	88	4	3	3	3	2	2	0	0	1	1	4	3	115	100
Total active tuberculosis (including 3 "other").....	131	74	12	7	13	7	6	3	3	2	6	3	5	3	176	100
Percent far advanced.....	77		33		23		33		0		17		80		65	
Mean age.....	46		26		41		55		28		46		44		44	

tuberculosis. In a way we are trying to discover motivation: that is, what is the underlying cause that gave rise to the chain of events that led to the person presenting himself to a physician or to an X-ray survey to find out if he had tuberculosis.

Data for the cases of tuberculosis admitted to the State sanatorium at Oakdale, Iowa, during the calendar year 1952 are presented in table 3. There were 176 of these cases; 10 were minimal; 48, moderately advanced; and 115, far advanced. We had already noted from the data released by the Public Health Service that the proportion of far advanced tuberculosis is higher for Iowa (52.7 percent) than for any State in the United States (1).

In our study we included factors which would help us to find out why such a large proportion of the new cases in Iowa are in the far advanced stage.

It will be noted that 74 percent of the cases admitted to Oakdale Sanatorium are described as having been discovered because of the person's own index of suspicion. This means that these people presented themselves to physicians for diagnosis because of symptoms which are ordinarily associated with tuberculosis. Contact investigation was the underlying reason for 7 percent, and a similar percentage came to diagnosis because of X-ray surveys.

It is perhaps worth noting that whereas analysis of the Oakdale figures shows that 7 percent of the admissions in 1952 were diagnosed because of X-ray surveys, our previous study showed that 28 cases of active tuberculosis were reported as being discovered in Iowa during 1952 because of the mass X-ray survey (approximately 8 percent of all the cases reported in Iowa). Thus, we note that both analyses tend to give the same result: Between 7 and 8 percent of all the active tuberculosis diagnosed in Iowa is diagnosed because of mass X-ray surveys.

It is also interesting that routine X-raying of all admissions to a general hospital produced 3 percent of the tuberculosis, examination of nurses produced 2 percent, and followup of inactive cases of tuberculosis produced 3 percent.

Of all the cases coming to diagnosis because of symptoms, 77 percent were in the far advanced stage. It is also of significance that

for other designated methods of case finding the proportion in the far advanced stage was never higher than one-third. This means that when we go out and aggressively look for tuberculosis among people who are not symptomatic and who are not going to their physician because of symptoms, two-thirds of the tuberculosis discovered is in a stage prior to far advanced.

We may also wish to consider the age of persons found by these various methods. It will be noted that, except for those found through hospital admission X-ray, the persons motivated by symptoms were the oldest, and those found through contact investigation and followup of student nurses were the youngest. Nevertheless, comparison with the rest of the United States shows that the tuberculosis patients reported in Iowa are not older than the average for the continental United States, according to the Public Health Service (1).

In the United States in 1952, more than 12 percent of the tuberculosis patients reported were of age 65 and over. In Iowa, less than 10 percent were in that age group. Other age groups show no great differences except that in Iowa a slightly smaller percentage of the tuberculosis patients reported was under 5 years of age than in the United States (1.0 versus 3.1).

Here, then, is a partial answer to our question as to why Iowa, with its low morbidity and mortality rate, has such a large proportion of its cases diagnosed in the far advanced stage. Three-quarters of all the cases of tuberculosis diagnosed in Iowa, as judged by the admissions to Oakdale Sanatorium, have come to diagnosis because of symptoms associated with tuberculosis. In other words, their tuberculosis has progressed to a stage where their symptoms are sufficient to arouse suspicion of tuberculosis or at least to motivate them to go to their physician to find out what ails them.

#### Indicators for the Future

What then can Iowa do about this large proportion of cases in the far advanced stage?

In what direction shall our case-finding program of the future be?

In view of the fact that 3 out of 4 patients come to diagnosis because of symptoms, shall we discontinue organized case finding and rely on

people to go to their physician when they are sick?

The answer to the last question is "No."

In Iowa, during 1952, 506 cases of active tuberculosis were reported; if the Oakdale distribution can be applied to these cases, we can say that 26 percent, or 132 cases of active tuberculosis, was found through organized case finding by health department effort. We can assume that most or all of these were benefited by early case finding and that, in addition, the community gained by taking out of circulation so many cases of infectious disease. Our problem is how to keep on removing from their environment this proportion of active cases, or a larger proportion, and to do it as early as possible.

Our case-finding programs of the future then would seem to be:

- ▶ Continued intelligent followup with periodic examination of all suspects and known inactive cases with special reference to cases referred to private physicians.

- ▶ Realistic followup and periodic examination of all contacts of active cases of tuberculosis.

- ▶ Expansion of routine X-raying on admission to hospitals and other institutions.

- ▶ Admission and periodic X-raying of inmates of mental sanatoriums, prisons, and other institutions for long-term care.

- ▶ Continued X-ray surveys of groups and areas of presumably high prevalence, such as the aged, transients, food handlers, overcrowded areas of our cities, and so forth.

- ▶ Preemployment X-raying and periodic examination of industrial groups and others who can have X-ray facilities made readily available.

- ▶ Continued tuberculin testing of students with X-ray of the positives and examination of contacts and associates.

Tuberculin testing of whole communities on an experimental basis with X-raying of all positive reactors would appear to be indicated.

Experience in a few areas would give us valuable information both from an administrative and epidemiological point of view regarding the merit of this method as a case-finding procedure.

## Summary

Two studies were made to evaluate tuberculosis case-finding procedures in Iowa.

One study shows that during 1952 at least 184 cases of tuberculosis, 41 of them active or questionably active, were found by the statewide program of the State department of health; these were found chiefly through X-raying. This number is approximately 8 percent of the active tuberculosis reported in Iowa in that year.

Another study of the reason for coming to diagnosis shows that approximately 75 percent of all cases of tuberculosis diagnosed in 1952 came to diagnosis because of symptoms related to tuberculosis. X-raying of the public produced 7 percent; contact investigation, 7 percent; and the remainder were found through followup of inactive tuberculosis, X-raying of hospital admissions and staff, and so forth.

Some of the possible reasons for such a large proportion being diagnosed because of symptoms are discussed, and the case-finding program for the future is proposed.

## ACKNOWLEDGMENT

Acknowledgment is made to Dr. W. M. Spear, medical director of the Iowa State Sanatorium at Oakdale, for his cooperation in making available for analysis the records of admissions during 1952.

## REFERENCE

- (1) U. S. Public Health Service: Reported tuberculosis morbidity and other data, calendar year 1952. Washington, D. C., The Service, 1953, 17 pp. Not available for distribution.

*A new medical statement, issued by the American Heart Association's Council on Rheumatic Fever and Congenital Heart Disease, gives current preventive measures. Prepared by the council's Committee on Prevention of Rheumatic Fever and Bacterial Endocarditis, the statement was first published in "Circulation," February 1955, and has had special distribution as part of the "Stop Rheumatic Fever" campaign.*

## Rheumatic Fever Prevention

A new statement on the prevention of rheumatic fever and bacterial endocarditis, issued in January by the American Heart Association, incorporates the important advances made in the field during the past 2 years.

The statement, a revision of the January 1953 report, presents techniques for treating and preventing streptococcal infections to forestall both initial rheumatic fever attacks and recurrences. It also recommends measures for preventing bacterial endocarditis, an occasional aftermath of rheumatic fever.

Among the new developments is the emphasis on eradication of streptococcal infections from the throat by full doses of penicillin. Recommended for the first time are intramuscular injections of long-acting benzathine penicillin G. In the long-term prevention of rheumatic fever recurrences, one tablet of penicillin a day has been found adequate.

With the issuance of the revised statement, the Public Health Service and the American

Heart Association are planning a cooperative campaign, starting this spring, to help communities establish rheumatic fever prevention programs, aimed at eventual eradication of this disease. A new film, booklet, and other education material have been prepared for distribution to the general public through local heart associations and health departments in the "Stop Rheumatic Fever" campaign.

Although the number of rheumatic fever deaths has been declining, some 1,500 children and young persons under 25 years of age and more than 19,000 others above age 25 died of rheumatic fever and rheumatic heart disease in 1953. Many thousands of new cases of rheumatic fever occur each year, and there are many more thousands of "old" cases.

Following is the revised statement entitled "Prevention of Rheumatic Fever and Bacterial Endocarditis Through Control of Streptococcal Infections."

### Treatment of Streptococcal Infections in the General Population

In the general population about 3 percent of untreated streptococcal infections are followed by rheumatic fever. Adequate and early penicillin treatment, however, will eliminate streptococci from the throat and prevent most attacks of rheumatic fever.

#### Diagnosis of Streptococcal Infection

In many instances streptococcal infections can be recognized by their clinical manifestations.

In some patients, however, it is difficult or impossible to determine the streptococcal nature of a respiratory infection without obtaining throat cultures. The following section on diagnosis has been included in order to reduce diagnostic errors and to assist physicians in avoiding unnecessary therapy.

The accurate recognition of individual streptococcal infections, their adequate treatment, and the control of epidemics in the community

presently offer the best means of preventing initial and recurrent rheumatic fever.

### COMMON SYMPTOMS

**Sore throat**—sudden onset, pain on swallowing.

**Headache**—common.

**Fever**—variable, but generally from 101° to 104° F.

**Abdominal pain**—common, especially in children; less common in adults.

**Nausea and vomiting**—common, especially in children.

### COMMON SIGNS

**Red throat.**

**Exudate**—usually present.

**Glands**—swollen, tender lymph nodes at angle of jaw.

**Rash**—scarlatiniform.

**Acute otitis media** } frequently due to  
**Acute sinusitis** } the streptococcus.

In the absence of the common symptoms and signs, occurrence of any of the following symptoms is usually not associated with a streptococcal infection: simple coryza, hoarseness, cough.

### LABORATORY FINDINGS

**White blood count**—generally over 12,000.

**Throat culture**—positive culture for hemolytic streptococci is almost always diagnostic.

### Treatment of Streptococcal Infections

When streptococcal infection is suspected, treatment should be started immediately. Penicillin is the drug of choice. Effective blood levels should be maintained for a period of 10 days to prevent rheumatic fever by eradicating the streptococci from the throat.

Penicillin may be administered by either intramuscular or oral route. Intramuscular ad-

ministration is recommended as the method of choice since it insures adequate treatment. Oral therapy by contrast is dependent upon the cooperation of the patient. On the other hand, some physicians and patients prefer repeated oral medication and object to injections.

### Recommended Treatment Schedules

#### INTRAMUSCULAR PENICILLIN

##### Benzathine Penicillin G

*Children*—one intramuscular injection of 600,000 units.

*Adults*—one intramuscular injection of 600,000 to 900,000 units.

**or Procaine Penicillin** with aluminum monostearate in oil.

*Children*—one intramuscular injection of 300,000 units every third day for 3 doses.

*Adults*—one intramuscular injection of 600,000 units every third day for 3 doses.

#### ORAL PENICILLIN

*Children and adults*—250,000 units 3 times a day for a full 10 days.

To prevent rheumatic fever by eradicating streptococci, therapy must be continued for the entire 10 days even though the temperature returns to normal and the patient is asymptomatic.

#### OTHER MEDICATION

It has not been established that the broad spectrum antibiotics are as effective as penicillin in preventing rheumatic fever. They should be used only if the patient is sensitive to penicillin. As with penicillin, the regimen of full therapeutic dosage for a full 10 days should be followed.

The following therapy is not effective in preventing rheumatic fever when used as treatment for streptococcal infections: sulfonamide drugs, penicillin troches or lozenges.

### Prevention of Streptococcal Infections in Rheumatic Individuals

Many streptococcal infections occur without producing clinical manifestations. For this reason, prevention of recurrent rheumatic fever

must depend on continuous prophylaxis rather than solely on treatment of acute attacks of streptococcal disease.

### Who should be treated?

All individuals who have a well established history of a previous attack of rheumatic fever or chorea or who show definite evidence of rheumatic heart disease should be placed on continuous prophylaxis.

### When should prophylactic treatment be initiated?

*Active rheumatic fever*—As soon as the diagnosis of rheumatic fever is made or any time thereafter when the patient is first seen. The streptococcus should be eradicated with penicillin (see Treatment Schedules) following which the prophylactic regimen is instituted.

*Inactive rheumatic fever*—In inactive rheumatic fever, prophylaxis should be instituted when the patient is first seen.

### How long should prophylaxis be continued?

Throughout life, or until new knowledge makes this recommendation invalid.

### Should prophylaxis be continued during the summer?

Yes, continuously. Streptococcal infections can occur at any season although they are more prevalent in the winter.

### What are the exceptions to continuous prophylaxis?

Uncertainty as to the validity of a history of a previous attack of rheumatic fever or chorea.  
Heart disease of questionable etiology.

In rare circumstances where exposure of the adult patient to streptococcal infection is unlikely.

### Prophylactic Methods—Oral and Intramuscular

Oral medication depends on patient cooperation. In most instances failures of sulfonamide or penicillin prophylaxis occur in patients who fail to ingest the drug regularly. This can be avoided by long-acting depot penicillin given intramuscularly once a month.

## SULFADIAZINE—ORAL

This drug has the advantage of being easy to administer, inexpensive and effective (other newer sulfonamides are probably as effective). Although resistant streptococci have appeared during mass prophylaxis in the armed forces, this is rare in civilian populations.

*Dosage*—from 0.5 to 1.0 gm. taken each morning throughout the year. The smaller dose is to be used in children under 60 pounds.

*Toxic reactions*—infrequent and usually minor. In any patient being given sulfonamides, consider all rashes and sore throats as possible toxic reactions especially if they occur in the first 8 weeks. In patients on this prophylactic regimen it is hazardous to treat toxic reactions or intercurrent infections with sulfonamides. The chief toxic reactions are:

*Skin eruptions*: Morbilliform—continue drug with caution. Urticaria or scarlatiniform rash associated with sore throat or fever—discontinue drug.

*Leukopenia*: Discontinue if white blood count falls below 4,000 and polynuclear neutrophils below 35 percent because of possible agranulocytosis which is often associated with sore throat and a rash. Because of these reactions, weekly white blood counts are advisable for the first 2 months of prophylaxis. The occurrence of agranulocytosis after 8 weeks of continuous prophylaxis with sulfonamides is extremely rare.

## PENICILLIN—ORAL

Penicillin has the desirable characteristics of being bactericidal for hemolytic streptococci and of rarely producing serious toxic reactions. A careful history of allergic reactions and previous response to penicillin should be obtained.

*Dosage*—200,000 to 250,000 units once a day, before breakfast.

*Toxic reactions*:

*Urticaria and angioneurotic edema.*

*Reactions similar to serum sickness*—includes fever and joint pains and may be mistaken for rheumatic fever.



Although many individuals who have had reactions to penicillin may subsequently be able to tolerate the drug, it is safer not to use penicillin if the reaction has been severe and particularly if angioneurotic edema has occurred.

## **BENZATHINE PENICILLIN G INTRAMUSCULAR**

*Dosage*—1,200,000 units once a month.

*Toxic reactions*—same types as with oral penicillin but occur more frequently and tend to be more severe. Some local discomfort usually experienced.

## **Protection of Rheumatic Fever Patients in Hospital Wards**

Patients with rheumatic fever or rheumatic heart disease are often exposed to increased hazards in hospital wards as the result of contact with streptococcal carriers or patients with active streptococcal infections. Protection of the rheumatic patient is imperative because of the high rate of recurrence of rheumatic fever following streptococcal infection. In addition to the customary precautions employed to prevent cross infections, the following procedures are recommended:

All hospital patients with streptococcal infections should be fully treated by one of the methods outlined in Recommended Treatment Schedules in order to eliminate streptococci and avoid the carrier state.

Patients admitted with acute rheumatic fever should immediately receive a full course of antibiotic therapy, whether or not streptococci are isolated from the throat (see Recommended Treatment Schedules). As soon as the therapeutic course is completed, continuous streptococcal prophylaxis should be instituted (see Prophylactic Methods—Oral and Intramuscular).

Patients with inactive rheumatic fever or rheumatic heart disease should be placed on continuous streptococcal prophylaxis on admission to the hospital or as soon thereafter as the diagnosis is established (see Prophylactic Methods—Oral and Intramuscular).

## **Prophylaxis Against Bacterial Endocarditis**

In individuals who have rheumatic or congenital heart disease, bacteria may lodge on the heart valves or other parts of the endocardium, producing bacterial endocarditis. Transient bacteremia which may lead to bacterial endocarditis is known to occur following various operative procedures including dental extractions and other dental manipulations which disturb the gums, the removal of tonsils and adenoids, the delivery of pregnant women, and operations on the gastrointestinal or urinary tracts. It is good medical and dental practice to protect patients with rheumatic or congenital heart disease by prophylactic measures.

### **Recommended Prophylactic Methods**

Penicillin is the drug of choice for administration to patients with rheumatic or congenital heart disease undergoing dental manipulations, or operative procedures in the oral cavity.

Although the exact dosage and duration of therapy are somewhat empirical, there is some evidence that for effective therapeutic prophylaxis reasonably high concentrations of penicillin must be present at the time of the operative procedure. The dosage regimens employed for long-term prophylaxis of rheumatic fever are inadequate for this purpose. There is reason to believe that continuous maintenance of penicillin in the blood over a period of several days will result in the death of those organisms which have lodged in the heart valve during the period of transient bacteremia.

Not only should penicillin prophylaxis be designed to afford maximum protection, but the method must also be practical. In general, the parenteral route of administration is preferred. All patients should be instructed to report to their physician or clinic should they develop a fever within a month following the operation.

## INTRAMUSCULAR PENICILLIN

*Dosage*—600,000 units of aqueous penicillin and 600,000 units of procaine penicillin in oil containing 2 percent aluminum monostearate administered intramuscularly 30 minutes before the operative procedure.

## ORAL PENICILLIN

As an alternative, although considered less desirable, penicillin may be administered by the oral route.

*Dosage*—250,000 to 500,000 units one-half hour before each meal and at bedtime, beginning 24 hours prior to the operation and continuing for 5 days. At the time of the operative pro-

cedure it is advisable to give an additional 250,000 units.

*Contraindications*—Patients who give a history of sensitivity to penicillin.

## OTHER ANTIBIOTICS

The broad spectrum antibiotics should be employed as prophylaxis in patients who are sensitive to penicillin or in those who are undergoing surgery of the urinary or lower gastrointestinal tract. Oxytetracycline, chlortetracycline, or erythromycin should be administered in full dosage for 5 days, beginning treatment the day prior to the surgical procedure.

## Public Education Materials

Education materials for the general public on rheumatic fever prevention include:

A 12½-minute, 16-mm. film, entitled "Stop Rheumatic Fever," produced by Transfilm, Inc., for the National Heart Institute with the cooperation of the American Heart Association.

A new booklet for adults, "Stop Rheumatic Fever," summarizing the film content and illustrated with stills from the film. The booklet tells about streptococcal infections and what to do about them to prevent rheumatic fever and rheumatic heart disease.

A discussion guide to aid users of the film and

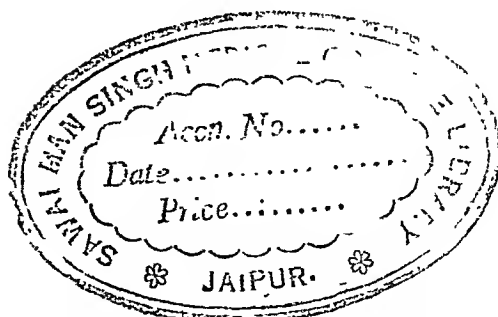
other educational material in arranging programs for parents, teachers, and community health meetings.

A pamphlet, entitled "Now You Can Protect Your Child Against Rheumatic Fever," which features a chart advising on "when to call the doctor and what to tell him about your child's sore throat."

A question-and-answer leaflet presenting background information on rheumatic fever.

These materials are available from local heart associations and health departments as well as from the American Heart Association, 44 East 23d Street, New York 10, N. Y., and the Heart Information Center, National Heart Institute, Public Health Service, Bethesda 14, Md.

PHR



## Infective Larvae of *Ancylostoma caninum*

16 mm., sound, black and white, 4 minutes, 157 feet. 1954.

**Audience:** Parasitologists, students of parasitology and biology, and others interested in the study of intestinal parasites.

**Available:** Loan—Public Health Service, Communicable Disease Center, 50 7th St., NE., Atlanta 5, Ga. Purchase—United World Films, Inc., 1445 Park Ave., New York 29, N. Y.

Infective larvae of the dog hookworm is the subject of this motion picture, which has been filmed especially for parasitologists and students of parasitology and biology. It shows the migration upward from beneath the surface of the soil of large numbers of infective hookworm larvae. Another phase of the larva behavior pictured is the vertical position assumed on soil particles, either singly or in tufts composed of dozens of worms.

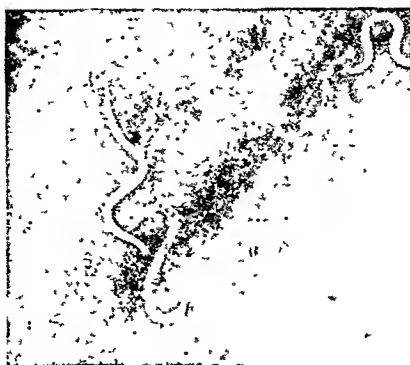
## *Ancylostoma caninum* in the Intestine of the Dog

16 mm., sound, black and white, 5 minutes, 184 feet. 1954.

**Audience:** Parasitologists, students of parasitology and biology, and others interested in the study of intestinal parasites.

**Available:** Loan—Public Health Service, Communicable Disease Center, 50 7th St., NE., Atlanta 5, Ga. Purchase—United World Films, Inc., 1445 Park Ave., New York 29, N. Y.

Bloodsucking activities and copulation of adult hookworms in the intestine of the dog are featured in this motion picture. The hookworm species *Ancylostoma caninum* is used in the demonstration. Characteristics of the parasite shown are the large numbers of living hookworms



***Ancylostoma caninum* in the  
intestine of the dog**

able to attach themselves to the intestinal mucosa; the worms ingesting blood and eliminating it from their posterior end; and the continued feeding of the parasites while the male and female are in copula. The amount of blood lost by the host through the feeding of a single worm is an interesting depiction.

## An Outbreak of *Salmonella* Infection

16 mm., sound, black and white, 13 minutes, 481 feet. 1954.

**Audience:** Pathologists, nutritionists, dietitians, sanitarians, and others interested in foodborne disease control.

**Available:** Loan—Public Health Service, Communicable Disease Center, 50 7th St., NE., Atlanta 5, Ga. Purchase—United World Films, Inc., 1445 Park Ave., New York 29, N. Y.

A simulated case study of foodborne illness is used in this motion picture to illustrate to viewers the problems caused by an outbreak of foodborne infection. Organisms of the *Salmonella* group have been chosen for this demonstration of typical food contaminants.

The film depicts the sources of *Salmonella* organisms; factors contributing to the survival and transfer of the organisms; and ways in which contamination may occur. It describes an illness outbreak in terms of persons exposed to and susceptible to the infection. Recommended

methods for sanitary food handling under ordinary circumstances are shown.

## Transmission of Anthrax— Animal to Man

35 mm. filmstrip, sound, color, 12 minutes, 70 frames. 1954.

**Audience:** Pathologists, physicians, medical students, and others interested in disease transmission control.

**Available:** Loan—Public Health Service, Communicable Disease Center, 50 7th St., NE., Atlanta 5, Ga. Purchase—United World Films, Inc., 1445 Park Ave., New York 29, N. Y.

Using both artists' sketches and clinical photographs, this filmstrip traces the history of anthrax from the time of the Pharaohs to the present, emphasizing particularly the work of Chabert, Koch, and Pasteur. It shows how anthrax spores are brought into the United States on imported animal products such as wool, hair, and hides; and how human anthrax infection generally can be traced to diseased cattle, sheep, or swine in rural areas and to animal products used by industry.



**A healing anthrax lesion**

The appearance of anthrax lesions and response to clinical treatment are demonstrated in pictures of several cases of human anthrax.

On maps is shown the distribution in the United States of human and of animal anthrax during 1953; and on a bar chart is indicated the number of reported cases of human anthrax in the United States for the years 1944 to 1953.

*An important new development in the serodiagnosis of syphilis is the demonstration of at least two Treponema pallidum agglutinating antibodies in syphilitic serums.*

# Agglutination of *Treponema pallidum* by Reagin Antibody

By CHARLOTTE P. McLEOD, Sc.D., and PEGGIE S. STOKES, A.B.

SPECIFIC AGGLUTINATION of killed *Treponema pallidum* has been demonstrated by several investigators (1-3). Recently, McLeod and Magnuson (4) showed that agglutination of *T. pallidum* in syphilitic serum was greatly enhanced by the coagulating action (5) of fresh steer serum. A preliminary evaluation (4) of this technique as a diagnostic test for syphilis indicated that the comparatively simple agglutination test might be as sensitive and specific as the *T. pallidum* immobilization (TPI) test (6). Subsequent experiments, however, have made clear that the agglutination test in its present form detects more than one antibody and is in part a measure of reagin. These investigations, together with

a study of certain factors which influence the sensitivity of the test, are the subject of the present paper.

## Methods

The methods used were similar to those earlier described in detail (4). Spirochetes were extracted in saline from testicular lesions of rabbits inoculated 7 to 10 days earlier with the Nichols strain of *T. pallidum*. The organisms were sedimented by centrifugation, resuspended in fresh saline, and the suspensions adjusted to contain approximately 60 to 75 spirochetes per high-power field. In order to insure even distribution of the organisms, bovine albumin fraction V was added in a final concentration of 5 percent. The antigens were then heated at 56° C., unless otherwise stated, and stored at -20° C.

Serum samples to be tested were similarly stored at -20° C. Steer serum was stored in a CO<sub>2</sub> chest at -76° C. and was not thawed until immediately before use. The same lot of steer serum was employed in all experiments. It was titered for natural agglutinins against each new antigen, and the lowest dilution which did not agglutinate the spirochetes was used in the test (1:7 to 1:15 dilution).

In performing the tests, the antigen was pre-

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*Results of the TPI tests were supplied by George Cannefax, who is also with the Venereal Disease Experimental Laboratory.*

*This paper was presented at the Symposium on Recent Advances in the Study of Venereal Diseases, Washington, D. C., April 29, 1954.*

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**Table 1. Effect of absorptions with VDRL antigen on the agglutinating titer of syphilitic serum**

Added to tests	Agglutinating titers <sup>1</sup>			
	Control pool B (VDRL 1:32)		Absorbed pool B (VDRL negative)	
	10 minutes	2 hours	10 minutes	2 hours
Saline--- Steer serum.	Negative-- 1:80-----	1:40 1:160	Negative-- Undiluted--	Undiluted. 1:40.

<sup>1</sup> Antigen heated at 56° C. for 40 minutes.

sensitized by the antibody before adding the steer serum, and parallel tests were run without steer serum. One-tenth cubic centimeter of antigen was mixed with 0.1 cc. of test serum or dilution in Wassermann tubes and the mixtures were shaken for either 2 or 23 hours. One-tenth centimeter of steer serum or saline was then added and the tubes were shaken for an additional 10 minutes. The tests were shaken on a standard Kahn shaker, or on a much less vigorous shaker with a rotary motion (250 revolutions per minute, 1-inch diameter). The tests were incubated either at room temperature (21° to 24° C.) or in an incubator at 33° to 35° C. Although agglutination occurred more rapidly on the Kahn shaker, the titers obtained in 2 hours on the positive control syphilitic serum pool B were similar on both shakers and were unaffected by the temperature of incubation. The method of reading the tests has been described (4). In the present study, titers are expressed as the lowest dilution which showed strongly positive agglutination (3+ to 4+).

Nonsyphilitic serum containing reagin antibody was produced by the method of Eagle (7) in normal rabbits whose serum initially showed negative VDRL (8) and agglutination tests. The animals were injected with saline suspensions of washed lipoidal antigen-antibody precipitate obtained by absorbing human syphilitic serum with VDRL antigen. (Twenty-five cubic centimeters of serum, VDRL titer 1:8, were absorbed once with the washed sediment from 125 cc. of antigen. Thirty cubic centimeters of serum, VDRL titer 1:64, were

absorbed three times with sediment from a total of 525 cc. of antigen.) Each dose was contained in a volume of 5 cc. Five rabbits were inoculated intraperitoneally with 5 doses each during a period of 13 days and were bled on the day following the last injection.

## Results

A first experiment showed the presence of at least two agglutinating antibodies in syphilitic serum. A portion of human syphilitic serum pool B, which contained both reagin and TPI antibodies, was absorbed with VDRL antigen until a negative VDRL slide test was obtained. The agglutination titers of the control serum and of the reagin-absorbed serum were then compared in a test with antigen which had been heated at 56° C. for 40 minutes. The tests were read after incubation periods of 10 minutes and 2 hours.

The results, shown in table 1, indicate that a part of the agglutinating activity of pool B was due to the presence of reagin. This is shown most clearly at 10 minutes in the test with steer serum, and at 2 hours in the test without steer serum. In the test with steer serum, control pool B (VDRL 1:32) showed an agglutination titer of 1:80 at 10 minutes whereas absorbed pool B (VDRL negative) agglutinated only when undiluted. In the 2-hour test without steer serum, the titer of pool B was 1:40, whereas absorbed pool B agglutinated only when undiluted. The presence of another agglutinating antibody, not identical with reagin, was demonstrated in absorbed pool B in the test with steer serum. The absorbed serum contained no meas-

**Table 2. Effect of immunizing rabbits with VDRL antigen-antibody precipitate**

Rabbit No.	VDRL titer	Agglutinating titer <sup>1</sup> (with steer serum)	TPI titer
4744-----	1:128	1:160-----	Negative.
4756-----	1:64	1:80-----	Do.
4755-----	1:64	1:40-----	Do.
4746-----	1:32	Undiluted----	Do.
4754-----	1:32	-----do-----	Do.

<sup>1</sup> Antigen heated at 56° C. for 40 minutes. Tests

**Table 3. Effect of incubation time on agglutinating titers of syphilitic serum and nonsyphilitic reagin serum**

Added to tests	Agglutinating titers <sup>1</sup>					
	Control pool B (VDRL 1:32)		Absorbed pool B (VDRL negative)		Nonsyphilitic reagin serum (VDRL 1:64)	
	2 hours	23 hours	2 hours	23 hours	2 hours	23 hours
Saline.....	1:20	1:80	Undiluted.....	1:20	1:10	1:10
Steer serum.....	1:320	1:320	1:40.....	1:160	1:10	1:10

<sup>1</sup> Antigen heated at 56° C. for 40 minutes.

urable reagin but had an agglutination titer of 1:40 at 2 hours.

In a second experiment it was shown that *T. pallidum* was agglutinated by reagin antibody in nonsyphilitic serum. Five normal rabbits were immunized with lipoidal antigen-antibody precipitate as described under "Methods," and the serum from these animals was tested for the presence of reagin, agglutinating, and TPI antibodies. The agglutination tests were run with steer serum, using antigen heated at 56° C. for 40 minutes, and were read at 2 hours. The titers obtained in the three tests are shown in table 2. All of the serums gave positive VDRL and agglutination tests but negative TPI tests. The VDRL titers ranged from 1:32 to 1:128, and the agglutinating titers ranged from undiluted to 1:160. Three rabbits were high in both VDRL and agglutinating titers. In the two rabbits with low titers, the VDRL test appeared to be a more sensitive test for reagin than the agglutination test.

A study was next made of the effect of the length of the incubation period on the agglutinating titer. The serum samples from the five rabbits immunized with VDRL antigen-antibody precipitate were pooled and designated "nonsyphilitic reagin serum." Agglutination tests were run on this serum, which contained only reagin antibody; on pool B, which contained reagin and at least one additional antibody; and on absorbed pool B, from which the reagin antibody had been removed. The tests were run with antigen which had been heated at 56° C. for 40 minutes and were read after incubation periods of 2 and 23 hours. The results are shown in table 3.

The nonsyphilitic reagin serum (VDRL 1:64) showed no rise in titer on prolonging the incubation period from 2 to 23 hours. In the test with steer serum, pool B (VDRL 1:32) also showed no rise in titer after 2 hours. On the other hand, absorbed pool B (VDRL negative) showed a fourfold rise in titer between 2 and 23 hours. This slow rise in titer of the second antibody apparently was masked, or partially masked, in control pool B by the rapid agglutinating action of the reagin antibody. The addition of steer serum caused no rise in the titer of the nonsyphilitic reagin serum either at 2 or at 23 hours. In both the control and the absorbed pool B, the addition of steer serum caused a rise in titer at 23 as well as at 2 hours.

The effect of heat on the sensitivity and specificity of the antigen was investigated. In preparing the antigens for these studies, aliquot portions of the same spirochete suspension were used. One portion was not heated; a second portion was heated at 56° C. for 40 minutes, and a third portion was heated at 100° C. for 40 minutes.

The sensitivity of these antigens was tested in a first experiment with control pool B and with pool B which had been absorbed with VDRL antigen; and in a second experiment, with the nonsyphilitic reagin serum. The tests were read after an incubation period of 2 hours, with results which are illustrated in table 4. The titers of each of the three serums increased both with and without steer serum as the antigens were heated. Heating the antigen at 100° C. increased its sensitivity to the reagin antibody, as shown by the titers of the nonsyphilitic

**Table 4. Effect of heat on agglutinability of antigen in syphilitic serum and in nonsyphilitic reagin serum**

Serum tested	Added to tests	Agglutinating titers at 2 hours		
		Antigen not heated	Antigen heated, 56° C., 40 minutes	Antigen heated, 100° C., 40 minutes
Experiment 1:				
Pool B (control)-----	Saline-----	1:10-----	1:40-----	1:160
	Steer serum-----	1:20-----	1:320-----	1:1,280
Pool B (absorbed)-----	Saline-----	Undiluted (3+)-----	Undiluted (4+)-----	1:10
	Steer serum-----	Undiluted (4+)-----	1:80-----	1:320
Experiment 2:				
Nonsyphilitic reagin serum-----	Saline-----	Negative-----	1:20-----	1:40
	Steer serum-----	do-----	1:20-----	1:320

reagin serum, and to the second antibody as shown by the titers of the reagin absorbed syphilitic serum. Heating the antigen at 100° C. also markedly increased its sensitivity to the conglutinating action of steer serum. This is shown most clearly in the tests with the non-syphilitic reagin serum. The addition of steer serum caused no rise in titer with the antigen heated at 56° C., but caused an eightfold rise with antigen heated at 100° C.

In testing the effect of heat on the specificity of the antigen, agglutination tests were run on serum samples from 19 individuals with negative VDRL and TPI tests (medical students and laboratory personnel). The undiluted serum from each donor was tested both with and without steer serum against antigen heated at 56° C. for 40 minutes and against antigen heated at 100° C. for 40 minutes. The tests with antigen heated at 56° C. were read after incubation periods of both 2 and 23 hours. The tests with antigen heated at 100° C. were read at 23 hours. Since approximately the same findings were obtained on each serum both with and without steer serum, the results of the two techniques have not been tabulated separately. The numbers of serums showing positive or negative agglutination with each antigen are listed in table 5.

With antigen heated at 56° C., 18 of the 19 normal serums were negative at 2 hours and 1 was weakly positive (1+). At 23 hours, 7 serums remained negative, and 12 were weakly

positive. With antigen heated at 100° C., only 1 serum was negative at 23 hours. Of the 18 samples showing agglutination, 3 were weakly positive (2+) and 15 gave strongly positive reactions (3+ to 4+).

### Discussion

The experiments show that the utilization of the agglutination technique as a diagnostic test for syphilis must await the preparation of more specific antigens. The test with heat-killed spirochetes measured at least two different antibodies in syphilitic serum. One antibody

**Table 5. Effect of heat on agglutinability of antigen in undiluted normal human serum**

Agglutination test procedure	Total serums tested <sup>1</sup> (TPI negative, VDRL negative)	Results of agglutination test		
		Negative	1+, 2+	3+, 4+
Antigen heated at 56° C.:				
Incubated 2 hours---	19	18	1	0
Incubated 23 hours--	19	7	12	0
Antigen heated at 100° C.:				
Incubated 23 hours--	19	1	3	15

<sup>1</sup> Each serum was tested with and without steer serum, with similar results.

showed rapid agglutinating activity and was proved to be reagin. The second antibody acted more slowly and has not been identified. Its possible identity with the TPI antibody will be the subject of a later report.

The mechanism by which steer serum enhances agglutination has not been explained. With the reagin antibody, the reaction appeared to be accelerated. The reagin titer was higher with steer serum in tests read at 10 minutes, but no enhancement was obtained after an incubation period of 2 hours. On the other hand, in experiments with syphilitic serum from which reagin had been removed, steer serum enhanced agglutination after an incubation period of 23 hours. Whether this effect was due to an increased sensitivity of the test or to the participation of more than one antibody has not been determined. These problems, together with the preparation of more efficient antigens, are under continued study.

### Summary

The presence of at least two agglutinating antibodies was demonstrated in syphilitic serum. One antibody agglutinated rapidly and was identified as reagin. The identity of the other, more slowly acting, antibody has not been determined. The sensitivity of the antigen increased in proportion to the temperature at

which it was inactivated. Heating the antigen at 100° C. markedly decreased its specificity.

### REFERENCES

- (1) Tani, T.: Studies on the agglutination of syphilis spirochetes. Jap. J. Exper. Med. 18: 11, Feb. 20, 1940.
- (2) Cain, R. M.: The phenomenon of treponemal agglutination for the serodiagnosis of syphilis. A preliminary report. Canad. J. Pub. Health 44: 61-66, February 1953.
- (3) Hardy, P. H., and Hollander, D. H.: Studies on the agglutination of *Treponema pallidum* by immune sera. Symposium on recent advances in the study of venereal diseases, Washington, D. C., U. S. Public Health Service, 1953.
- (4) McLeod, C. P., and Magnuson, H. J.: Agglutination of *Treponema pallidum* in syphilitic serums. Pub. Health Rep. 68: 747-755, August 1953.
- (5) Hole, N. H., and Coombs, R. R. A.: The conglutination phenomenon. I. An introduction to the conglutination phenomenon and an account of the observation and views of previous investigators. J. Hyg. 45: 480-489, December 1947.
- (6) Nelson, R. A., Jr., and Mayer, M. M.: Immobilization of *Treponema pallidum* in vitro by antibody produced by syphilitic infection. J. Exper. Med. 89: 369-393, Apr. 1, 1949.
- (7) Eagle, H.: Studies in the serology of syphilis. VI. The induction of antibodies to tissue lipoids (a positive Wassermann reaction) in normal rabbits. J. Exper. Med. 55: 667-681, April 1932.
- (8) Harris, A., Rosenberg, A. A., and Del Vecchio, E. R.: The VDRL slide flocculation test for syphilis. II. A supplementary report. J. Ven. Dis. Inform. 29: 72-75, March 1948.

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# Physicians in Public Health

By LEONARD S. ROSENFELD, M.D., M.P.H.  
and MARION E. ALTENDERFER, B.A.

PUBLISHED DIRECTORIES and listings accumulated by several professional organizations and health agencies give only partial or noneurrent information on the number and characteristics of physicians who devote full time to public health activities. All such listings have been prepared for some specific purpose which in no case encompasses that of providing a complete inventory of full-time public health physicians.

The purposes of the present study were to obtain as complete a count as possible of physicians engaged full time in the field of public health; to analyze their characteristics, qualifications for public health work, and geographic distribution; and to ascertain their medical school background. This paper covers the first two of these purposes.

Prerequisite to making such a study was the adoption of a definition of public health. Although not providing specific criteria for selection of physicians, the broad and widely accepted concept of public health as organized

community effort for "preventing disease, prolonging life, and promoting physical and mental health and efficiency," expressed by Dr. C.-E. A. Winslow (1), seemed the most useful. With this definition, it was possible to establish a broad requirement for inclusion in the study, that is, service in preventive medicine as a teacher, an administrator, a research investigator, or a practitioner in governmental or organized voluntary activities, as contrasted with service in clinical medicine or independent practice.

As will be shown in the discussion of the available sources of information, decisions with regard to the inclusion or exclusion of individual physicians had to be fairly arbitrary, and the list compiled is admittedly incomplete. Nevertheless, the accumulation of a total count of almost 3,500 full-time public health physicians and the analysis of data on their distribution by age, position, and geographic location are believed to be a useful start toward more definitive and detailed studies.

## Materials and Method

The primary sources used in the study were the following:

1. The list of diplomates of the American Board of Preventive Medicine in the 1951 edition of the Directory of Medical Specialists (2) plus a list of physicians who received their certificates in 1951, the latter obtained from the files of the secretary of the board.
2. The 1951 Directory of Full-Time Local Health Units (3).

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*Dr. Rosenfeld, now director of medical care evaluation studies, United Community Services of Metropolitan Boston, was chief of the Health Profession Education Branch, Division of Public Health Methods, Public Health Service, when this study was made. Miss Altenderfer is a statistician in the Division of Public Health Methods. Other members of the division who assisted in preparing the report are Dr. Leslie Knott, Martha D. Ring, and Kathryn I. Baker.*

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3. The 1951 Directory of State and Territorial Health Authorities (4).

4. Information on full-time faculty members in schools of public health obtained in a 1950 survey of these schools (5).

5. A list of physicians with regular or active reserve commissions in the Public Health Service who were engaged in nonclinical work in 1951.

6. Information on full-time faculty members in departments of preventive medicine obtained by the Office of Defense Mobilization in its 1951 survey of medical school faculties.

7. Schedules listing full-time health department personnel collected by the Division of State Grants, Public Health Service, in a study made for the National Security Resources Board in 1951.

8. Lists furnished by the Army, Navy, and Air Force of personnel giving full time to preventive medicine and public health in 1951 (Air Force data are for 1953).

None of these sources gives a complete picture of all physicians engaged full time in public health work. The following limitations on the inclusiveness of the listings should be noted.

The roster of diplomates of the American Board of Preventive Medicine does not include all physicians in public health because many of them lack the requisite 6 years of special training, teaching, or practice in preventive medicine. Furthermore, the board was established only in 1948, and many eligible physicians have not yet applied for certification. The diplomates, therefore, represent only the more experienced physicians in the field of public health.

Reports of the number of physicians employed full time in State and local departments and other non-Federal governmental agencies, of course, give no indication of the number in other types of organizations. Numerous physicians engaged in public health work are employed by voluntary agencies and foundations.

Since the Public Health Service, the Army, the Navy, and the Air Force are responsible for a wide range of operations in the field of medicine, it was necessary to separate the physicians concerned primarily with public health from those concerned primarily with clinical medicine. For Public Health Service person-

nel, all physicians with a Regular or Active Reserve Corps commission engaged in non-clinical work were included, whether in the Public Health Service or detailed to other Federal agencies. For the other services, groups of physicians working full time in various branches of preventive medicine were selected, after a review of the classification maintained in each service, on the basis of both qualifications and nature of assignment. None of these services was able to furnish a complete listing of physicians giving full time to preventive medicine.

Other Federal agencies—such as the Children's Bureau, Department of Health, Education, and Welfare; the Veterans Administration; and the Atomic Energy Commission—which employ a number of public health physicians, were not asked for lists. Some of their public health physicians are included, however, because they are commissioned officers of the Public Health Service or because they are diplomates of the American Board of Preventive Medicine. For example, almost two-thirds of the regional medical directors and the physicians on the headquarters staff of the Children's Bureau are diplomates.

In addition to the 8 primary sources of information, 3 secondary sources were used to supply biographical data: the 1950 American Medical Directory (6), the 1951 Membership Directory of the American Public Health Association (7), and lists of physicians awarded public health degrees by approved schools of public health.

Physicians listed only in the secondary sources were not included in the study, for various reasons. There is no assurance, for example, that all 1,567 physicians listed in the 1950 American Medical Directory as limiting their practice to public health were actually in the public health field at that time. This directory is based on cards mailed to all physicians; the number of physicians who failed to return the card and for whom, therefore, the directory information is not current is unknown. The Directory of the American Public Health Association includes foreign physicians, physicians engaged only part time in public health, and physicians with an interest in public health, as well as those devoting full time to the field.

Because the major sources of information provided data for 1951, an effort was made to obtain data from other sources relating as closely as possible to that year.

In collating the information from the several primary sources, the following procedure was used: The names of all diplomates of the American Board of Preventive Medicine were first entered on cards. These cards were alphabetized and checked against the directories of State and local health departments; a card was then made for each additional physician listed in these directories. In like manner, cards were added for physicians listed in the other primary sources. Of the 3,484 physicians included in the study, 29 percent were obtained from the list of diplomates; 27 percent from the directories of State and local health departments; 25 percent from the special study of health department personnel; 14 percent from the list of Public Health Service commissioned officers; and 5 percent from the other sources.

The card for each physician contained as much of the following information as could be obtained: name; State and city in which located; year of birth; medical school; year of graduation; specialty board certification, if any; present position; degree in public health, if any; school from which degree in public health was obtained; date of degree in public health; specialty, if indicated in the American Medical Directory.

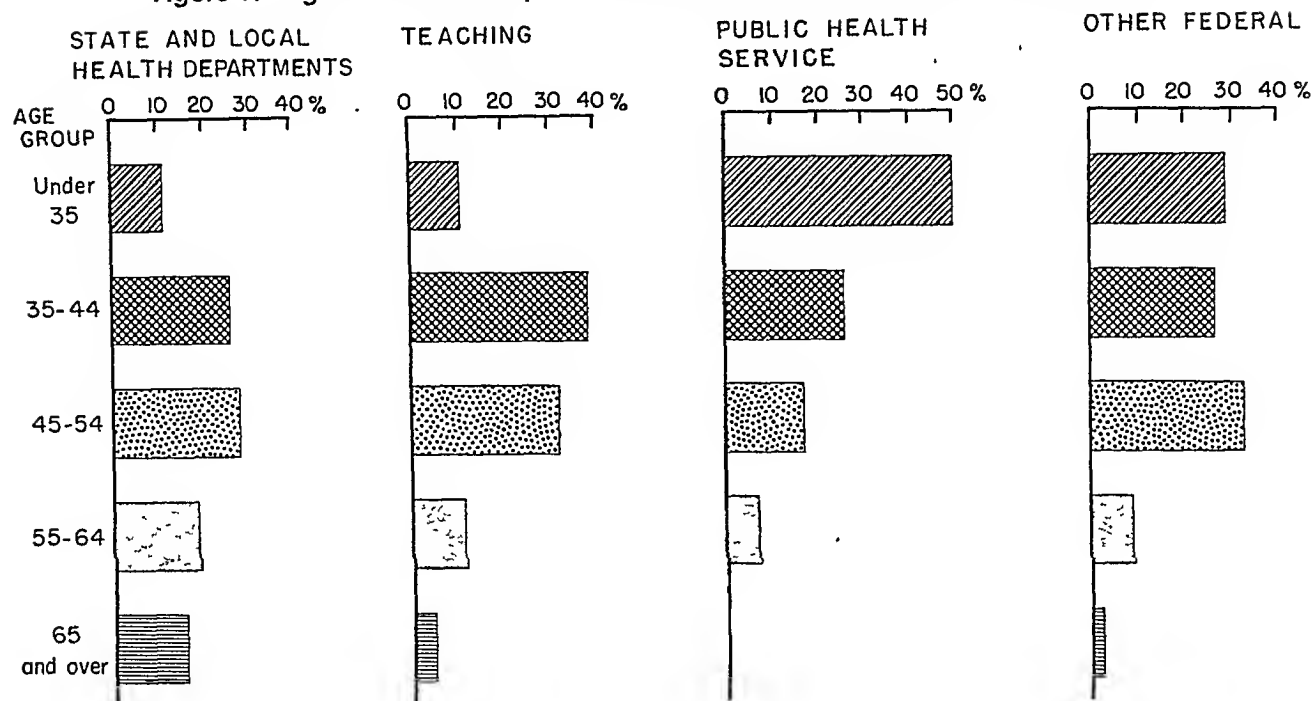
### Type of Position

In 1951, an estimated 3,441 physicians were engaged full time in some phase of public health work. Almost half (48 percent) of them were in local health departments. The next largest group (18 percent) comprised the commissioned officers of the Public Health Service. An additional 17 percent were in State and Territorial health departments. Physicians in Federal positions other than the Public Health Service

**Table 1. Public health physicians by present position and age, 1951**

Present position	All ages	Age group					
		Under 35	35-44	45-54	55-64	65 and over	Unknown
Total.....	3, 484	641	922	920	569	412	20
Engaged in public health work.....	3, 441	641	915	912	557	396	20
State or Territorial health department.....	581	53	186	196	93	52	1
Health officer.....	52	0	16	20	8	8	0
Other.....	529	53	170	176	85	44	1
Local health department.....	1, 645	186	383	414	338	310	14
Health officer.....	1, 003	92	205	238	215	241	12
Other.....	642	94	178	176	123	69	2
Other State or local agency.....	56	7	11	15	12	11	0
Teaching.....	168	18	65	54	19	9	3
School of public health.....	72	6	27	27	10	1	1
Preventive medicine in medical school.....	66	12	26	20	2	4	2
Other.....	30	0	12	7	7	4	0
Public Health Service.....	627	309	163	108	46	0	1
Other Federal.....	239	68	64	79	22	5	1
All other.....	125	0	43	46	27	9	0
Hospital.....	40	0	13	15	10	2	0
Voluntary agency or foundation.....	43	0	12	15	12	4	0
Other positions.....	42	0	18	16	5	3	0
Not engaged in public health work.....	43	0	7	8	12	16	0
Private practice.....	4	0	0	2	2	0	0
Retired.....	16	0	0	0	4	12	0
Position unknown.....	23	0	7	6	6	4	0

Figure 1. Age distribution of public health physicians by type of position, 1951.



accounted for 7 percent; those engaged in teaching, for 5 percent; and those working in State and local governmental agencies other than health departments, for 1 percent. The remaining 4 percent were in hospitals, voluntary agencies or foundations, or "other positions." In addition to the physicians engaged full time in public health, 4 physicians in private practice, 16 who were retired, and 23 for whom the present position was unknown are included, giving a grand total of 3,484 physicians. The physicians in the "all other" category and those not actually working in public health are included because they are diplomates of the American Board of Preventive Medicine.

### Age Distributions

Analysis of the physicians in public health by position and age brings out some interesting relationships. Of the 641 physicians under 35 years of age, 309, or 48 percent, are in the Public Health Service. At the other end of the age scale, 75 percent of the 412 physicians 65 years of age and over are in local health departments.

The distribution by age of physicians in different types of public health positions is shown in table 1 and figure 1. Although the proportions in each age group vary somewhat, the

age patterns are similar for physicians in State health departments, local health departments, and other State and local governmental agencies. For each of these, the largest proportion of physicians is in the 45-54 age group. The age distribution for physicians in full-time teaching positions differs in several respects from the distribution for physicians in those positions: The largest proportion of teachers is in the 35-44 age group, and the proportion in the youngest and oldest age brackets is smaller.

The percentage distribution by age of physicians in State and local health departments in the United States is shown separately in table 2. The proportion of physicians who are 55 years of age or over is substantially larger in local health departments (40 percent) than in State health departments (26 percent). This is attributable to two factors. First, physicians in positions other than that of health officer tend to be younger than the health officer. For example, 24 percent of local health officers are 65 years of age or over but only 11 percent of other physicians in local health departments are in this age group. Second, health officers account for 60 percent of physicians in local health departments but for only 9 percent of those in State health departments.

The distribution of all non-Federal physicians by region in relation to the population distribution is shown below :

	<i>Non-Federal public health physicians (percent)</i>	<i>1951 civilian population (percent)</i>
United States-----	100	100
Northeast-----	25	26
North Central-----	21	30
South-----	38	31
West-----	16	13

The Northeast and the West have about the same proportion of public health physicians and of population. The North Central region has a considerably lower proportion of public health physicians than of population, and in the South the reverse is found.

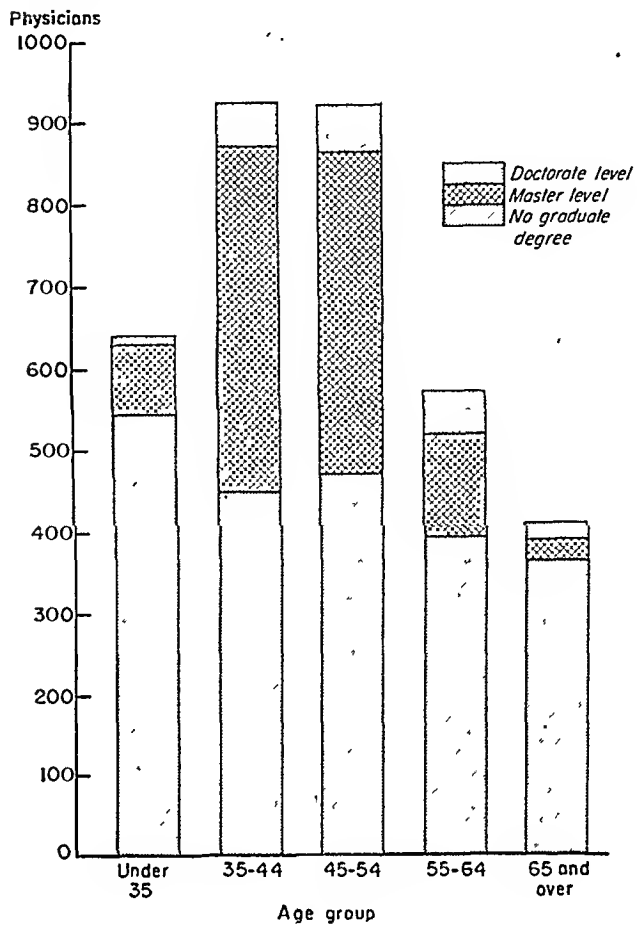
**Graduate Degrees**

Of the 3,484 public health physicians included in the study, 1,232 (35 percent) have one or more graduate degrees (table 4). Among the physicians with graduate degrees, 1,042 have a master's degree or certificate and 190 have a doctorate degree. The majority of those with master level training have a degree in public health, but a few hold a master of science or a master of arts degree. At the doctorate level, 139 hold the degree of doctor of public health, 38 are doctors of philosophy, and a few have other doctorates.

The proportion of physicians with graduate degrees varies considerably from one type of position to another. While 46 percent of all physicians in State health departments have graduate degrees, 73 percent of State health officers and only 43 percent of other physicians in State health departments have such degrees. The proportion with graduate degrees is high among public health physicians in teaching positions, in "other Federal" positions, and in "all other" positions. The lowest proportion is among the physicians in agencies of State and local government other than health departments. The comparatively low proportions of Public Health Service physicians with graduate degrees may be partly accounted for by the high proportion (49 percent) of physicians under 35 years of age in this group.

The number of physicians in each age group

**Figure 2. Public health physicians with or without graduate degrees by age group, 1951.**



with and without graduate degrees is shown in figure 2. In the group 65 years of age and over, 11 percent have a graduate degree; in the youngest age category, the proportion is 15 percent; for those aged 55-64 years, the proportion increases to 31 percent; in the two age groups 35-44 years and 45-54 years, 51 and 49 percent, respectively, have graduate degrees. The relatively low percentage of older physicians with public health degrees may be attributed to the fact that opportunities for graduate training in public health were limited until the late 1930's. The number of physicians with doctorate degrees is very small for those under 35 years of age, greater for those 65 years and over, and greatest for physicians in the middle age brackets.

Substantial differences are found among the four regions of the country in the proportion of State and local health department physicians with graduate degrees or with specialty quali-

fications in preventive medicine (table 5). As may be expected, the proportion of physicians with degrees closely parallels the proportion with specialty qualifications. These characteristics, in turn, are correlated with the proportion of physicians between 35 and 54 years of age. The West, with the highest proportion of physicians in this age group, has the highest proportion with graduate degrees or with specialty qualifications. The South, with the lowest proportion of public health physicians in the 35-54 age group, has the lowest proportion of physicians with these qualifications. In general, roughly the same relationships hold when characteristics of physicians in State and local agencies are examined separately.

### Specialization

Twenty-nine percent of the public health physicians in the study are diplomates of the Amer-

ican Board of Preventive Medicine (table 4). Again great variation appears among physicians in different types of positions. Physicians in "all other" positions are all diplomates—the reason for their inclusion in the study. State health officers have the highest proportion of diplomates (79 percent); physicians below the health officer level in local health departments, the lowest proportion (10 percent).

Of the 1,008 physicians who are diplomates of the American Board of Preventive Medicine, 66 also hold a certificate from another American board. In addition, 178 other physicians in the study are diplomates of other specialty boards—48 of pediatrics, 37 of internal medicine, 27 of psychiatry and neurology, 20 of pathology, and a few each of 9 other boards. In some instances this specialization indicates a shift in interest or in type of practice from the designated specialty to public health. In other instances a physician employed full time in a health de-

**Table 5. Physicians in health departments by regional location and professional characteristics, 1951**

Location	Total	With graduate degree			Percent with graduate degree	Diplomates of American Board of Preventive Medicine	
		Total	Master level	Doctorate level		Number	Percent
All health departments							
United States.....	2,061	701	625	76	34.0	443	21.5
Northeast.....	451	182	156	26	40.4	104	23.1
North Central.....	427	132	117	15	30.9	82	19.2
South.....	831	232	212	20	27.9	150	18.1
West.....	352	155	140	15	44.0	107	30.4
Local health departments							
United States.....	1,551	452	407	45	29.1	248	16.0
Northeast.....	298	113	99	14	37.9	61	20.5
North Central.....	333	79	69	10	23.7	40	12.0
South.....	656	161	147	14	24.5	82	12.5
West.....	264	99	92	7	37.5	65	24.6
State health departments							
United States.....	510	249	218	31	48.8	195	38.2
Northeast.....	153	69	57	12	45.1	43	28.1
North Central.....	94	53	48	5	56.4	42	44.7
South.....	175	71	65	6	40.6	68	38.9
West.....	88	56	48	8	63.6	42	47.7

### Data on States with full-time directors of training

State	Year system started	Degree held by director	Director reports administratively to—
California.....	1948	Dr. P.H.....	Director, division of administration.
Georgia.....	1952	M.D.....	Bureau of business administration
Louisiana.....	1946	M.D.....	State health officer.
Massachusetts.....	1950	Ph.D.....	Bureau of administration.
New York.....	1948	M.D.....	State health officer.
Ohio.....	( <sup>1</sup> )	( <sup>2</sup> )	State health officer.
Pennsylvania.....	1951	B.S.E., M.P.H.....	The executive office.
Virginia.....	1954?	M.D.....	Director of local health.

<sup>1</sup> Information incomplete.

<sup>2</sup> Position vacant.

training is the question of whether a State sends most or all of its new workers to one training station or disperses them among several. At one time thinking favored a single training center, but the current shifted.

In 1950, after 2 years of study, California changed to the use of dispersed stations, that is, several good local departments able and willing to receive several trainees in one or more fields. In reaching the decision it was felt that (*a*) several centers together could train more workers than one station, (*b*) quality did not suffer, (*c*) local interest was stimulated, and (*d*) cost was less.

Today, Florida and Texas are apparently the only States relying on a single training center. An exception exists with sanitarians, for whom the Communicable Disease Center of the Public Health Service has for some time maintained regional training centers.

When a local department is used for State training purposes, some special aid is usually extended by the State. This may be in the form of a lump sum increase in State aid, or of payment of a fee for each trainee, or of the assignment of extra personnel to the local staff.

Of the States with full-time directors of training, three States—California, Louisiana, and Massachusetts—have been stimulated and aided in development of training by grants from private foundations, either the Kellogg Foundation or the Commonwealth Foundation. Other States, including Michigan, Oklahoma, Tennessee, Texas, and Washington, have also had such aid. The laying of much of the groundwork in training was evidently due to this help from pioneering private agencies.

In California, Indiana, New York, Massachusetts, Michigan, and Ohio, the training office has also some responsibility in recruiting health workers for the department.

While schools of public health are active in formal training of health workers, many schools also contribute in a greater or lesser degree to extramural training or continuation education in the State or region where the school is located. Several schools of public health nursing also offer extension courses.

Some State departments of health are fortunate in receiving distinct aid in training from a nearby university. New Jersey has long been helped by Rutgers University, in both formal and short courses. Kansas, Kentucky, and Oklahoma also depend strongly on the State university. For a decade Florida has offered home study courses to local water works and sewage plant operators. Michigan in 1950 established the policy (*3*) of "limiting the department's sponsorship of training to those fields where the established educational institutions are unable to provide service." This expresses what most States are now doing. In Illinois the department of public health and the university conduct four correspondence courses in sanitation.

### Recommendations

Statistical evaluations in so wide a field are difficult, but as a result of this study my personal recommendations are as follows:

Training is a normal function of administration and should include service from the State to localities.

Every State department of health should have a training committee, preferably with members from local departments and from educational institutions whose major concern is with training policies.

Every State department of health should have one person designated as director or coordinator of training. In most States, he will devote part of his time to training and will be selected both for his interest in training and for the related nature of his other duties. In States with a larger number of State or local health workers, he should give his full time to training. Whether on a part-time or full-time basis, this person should work with others who will themselves do the actual training. He should use educational institutions wherever possible. He should preferably be a physician. His position in the department should be high enough to

exert influence. He should work and plan with the confidence that the ground swell is setting his way (4).

#### REFERENCES

- (1) U. S. Public Health Service. Division of Public Health Nursing Services: Annual census of nurses employed for public health work in the United States and Territories on January 1, 1953. Washington, D. C., The Service, 1953, table 3. Mimeographed.
- (2) Amos, F. B.: The public health training program of New York State. Pub. Health Rep. 68: 295-300, March 1953.
- (3) Michigan Department of Health: Public health recruitment and training. Fourth annual report. Ann Arbor, The Department, 1954, p. 5.
- (4) The State health department. An official statement of the American Public Health Association, adopted November 11, 1953. Am. J. Pub. Health 44: 235-252, February 1954.

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### PHS Staff Announcement

**Dr. Clifton K. Himmelsbach** was appointed chief, Division of Hospitals, Public Health Service, in March 1955. As chief of the division, he will have charge of all Public Health Service hospitals and outpatient clinics. With the Service since 1931, Dr. Himmelsbach had been assistant chief of the division until his recent appointment. Before then, 1948-53, he was in charge of the Washington, D. C., outpatient clinic, and,

earlier, chief of the Medical Operations Branch of the Federal Employee Health Program.

Included under Dr. Himmelsbach's direction is the Lexington, Ky., hospital for the treatment of narcotic addicts. At one point in his career, when he was assigned to the research branch of that hospital, Dr. Himmelsbach directed clinical investigations on the nature and quantification of narcotic addiction and the methods for detection of addiction liability in new drugs.



# Studies on Dental Care Services for School Children

—Third and Fourth Treatment Series, Woonsocket, R. I.—

By FRANK E. LAW, D.D.S., M.P.H., CARL E. JOHNSON, D.D.S.,  
and JOHN W. KNUTSON, D.D.S., Dr.P.H.

THE WOONSOCKET dental care study was designed to provide factual information on the problems of accumulated and maintenance dental service needs of school children in a fairly representative New England industrial town. Complete dental care, exclusive of orthodontics, was furnished all children enrolled in kindergarten through the ninth grade, provided treatment was requested by a parent or guardian. This long-term study, a cooperative project of the city of Woonsocket, the Rhode Island State Department of Health, and the Public Health Service, consisted of four consecutive treatment series. Study participants received in the course of each series an examination, a prophylaxis, topical fluoride applications, and treatment of dental defects. Data describing the organization and operation of the program and the results of the first and second treatment series have been previously reported (1). Performance

data descriptive of the third and fourth series are the subject of the present paper.

## Review of First Two Series

Examination findings disclosed that 84 percent of the participants in the first series had 1 or more permanent teeth needing filling; 22 percent had at least 1 missing permanent tooth; and 20 percent had 1 or more filled permanent teeth. In the 30 months required to complete the first series, the average child received 3.3 dentist man-hours of care. An average of 2.1 permanent teeth were treated per dentist man-hour.

Of children taking part in the second treatment series, 87 percent had 1 or more carious permanent teeth; 18 percent had 1 or more extracted permanent teeth; and 58 percent had at least 1 filled permanent tooth. The second series extended over a period of 24 months, with an average of 2.8 dentist man-hours devoted to each child. The number of permanent teeth treated per dentist man-hour averaged 1.9.

## Followup Program

A followup program for children whose parents had not requested treatment in the school

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*Dr. Law is regional dental consultant for Region III, Department of Health, Education, and Welfare; Dr. Johnson is a member of the staff of the Public Health Service Outpatient Clinic in New York City; and Dr. Knutson is chief dental officer of the Public Health Service.*

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clinic program was operated throughout the four series. Consisting largely of conferences with teachers and home visits, the program aimed at encouraging these parents to take their children to a private dentist regularly. Approximately 6 percent of the school population received care in private dental offices. Ten percent of the children would not accept treatment from any source during the period covered by this program.

### Clinic Routine

At the beginning of each series, teachers distributed "request for treatment" forms to all children regardless of whether or not they had previously participated in the study project. In each school, the entire student body was examined prior to the beginning of treatment. Every effort was made to keep the sequence of schools the same in all treatment series.

The first series was devoted exclusively to the correction of accumulated dental needs. The following rounds represented, therefore, a periodic treatment of accruing, or incremental, defects. For example, the fourth treatment series consisted largely of treatment of dental defects which had arisen since completion of the third, or preceding series. In addition to incremental defects, however, there was a continuing backlog of dental care needs reflecting

the new enrollment of children in school during each series. In the third treatment series, 1,123 children, or 23 percent of those receiving clinic care, fell into this category. In the fourth series, the 950 newly enrolled children constituted about one-fifth of the entire group treated in school clinics.

To measure and express the work load accurately, all teeth needing fillings, whether or not they had previously been filled, were counted as "caries." Also rated as carious were teeth indicated for extraction. The examination, recording, and treatment procedures utilized in the first two series (1) were continued throughout the program.

This report, like that on the first two series, is basically concerned with dental care services. Consequently, baseline and performance data apply only to those children participating in the school clinic program.

During the third treatment series, 5,975 children, or 98 percent of those enrolled in kindergarten through the ninth grade, were examined. Treatment was provided 82 percent of this group. In the fourth series, 6,201 children, or more than 99 percent of the school population, were examined. Of this group, 81 percent subsequently received dental treatment. The age distribution of children examined and their patient status for the final two treatment series are shown in table 1.

**Table 1. Age distribution of all children examined, by patient status, third and fourth treatment series, Woonsocket, R. I.**

Age last birthday	Third treatment series			Fourth treatment series		
	Patient status		All children	Patient status		All children
	Clinic	Private		Clinic	Private	
All ages.....	4, 912	1, 063	5, 975	5, 004	1, 197	6, 201
5.....	131	21	152	197	36	233
6.....	566	99	665	600	116	716
7.....	607	109	716	564	111	675
8.....	622	114	736	551	121	672
9.....	580	77	657	669	140	809
10.....	513	89	602	550	105	655
11.....	544	94	638	463	89	552
12.....	449	105	554	470	112	582
13.....	412	122	534	425	143	568
14.....	301	138	439	309	118	427
15.....	165	77	242	178	90	268
16.....	22	18	40	28	16	44

## Caries Prevalence

The annual increment of decayed permanent teeth, estimated from the difference in prevalence rates at individual ages, averaged 1.3 teeth per child. The proportion of children with one or more carious permanent teeth declined from 87 percent in the second round to 77 percent and 65 percent in the third and fourth rounds, respectively.

Age-specific rates for filled permanent teeth in the third series ranged from 0 at age 5 to 10.47 at age 15; in the fourth, from 0 to 11.18 for the same age groups (table 2 and figs. 1 and

2). At the beginning of the first series the corresponding rates were 0 to 2.33 teeth per child. For all age groups, the average frequencies for carious and missing permanent teeth per child dropped steadily from the first to the fourth series (table 3). At the same time, the number of filled teeth per child increased from 1.32 in the first series to 5.63 in the fourth. Only 20 percent of the children had one or more filled permanent teeth at the start of the program. In the third and fourth series, however, the proportion of children having filled teeth had increased to 70 and 74 percent, respectively.

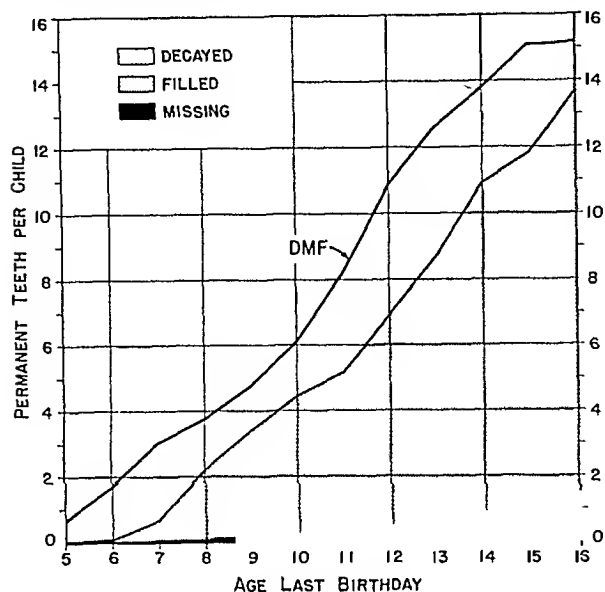
**Table 2. Dental caries prevalence in permanent teeth of children, third and fourth treatment series, Woonsocket, R. I.**

[Number of teeth per child]

Age last birthday	Cariou s <sup>1</sup>	Filled	Cariou s and/or filled <sup>2</sup>	Missing			DMF <sup>3</sup>
				Total	Extracted	Extrac- tions indicated	
Third treatment series							
5-16 <sup>4</sup> -----	3. 37	5. 19	7. 54	0. 47	0. 43	0. 04	7. 97
5-----	. 66	. 00	. 66	. 00	. 00	. 00	. 66
6-----	1. 68	. 05	1. 70	. 01	. 00	. 01	1. 70
7-----	2. 55	. 64	2. 98	. 04	. 02	. 02	3. 00
8-----	2. 02	2. 15	3. 72	. 06	. 03	. 03	3. 75
9-----	2. 13	3. 22	4. 58	. 17	. 13	. 04	4. 71
10-----	2. 64	4. 19	5. 88	. 25	. 20	. 05	6. 08
11-----	4. 24	4. 49	7. 97	. 24	. 21	. 03	8. 18
12-----	5. 36	6. 38	10. 42	. 52	. 46	. 06	10. 88
13-----	5. 65	8. 07	12. 03	. 62	. 57	. 05	12. 60
14-----	4. 68	10. 02	12. 93	. 90	. 86	. 04	13. 79
15-----	5. 34	10. 47	13. 87	1. 36	1. 24	. 12	15. 11
16-----	3. 46	12. 18	13. 73	1. 50	1. 41	. 09	15. 14
Fourth treatment series							
5-16 <sup>4</sup> -----	2. 28	5. 63	6. 98	0. 33	0. 30	0. 03	7. 28
5-----	. 31	. 00	. 31	. 00	. 00	. 00	. 31
6-----	. 94	. 14	1. 04	. 00	. 00	. 00	1. 04
7-----	1. 62	1. 22	2. 52	. 03	. 02	. 01	2. 54
8-----	1. 47	2. 67	3. 56	. 06	. 05	. 01	3. 61
9-----	1. 72	3. 31	4. 28	. 09	. 07	. 02	4. 35
10-----	2. 06	4. 35	5. 52	. 19	. 16	. 03	5. 68
11-----	2. 87	5. 42	7. 26	. 22	. 20	. 02	7. 46
12-----	3. 37	7. 23	9. 27	. 32	. 27	. 05	9. 54
13-----	3. 28	8. 93	10. 90	. 52	. 47	. 05	11. 37
14-----	3. 65	10. 66	12. 48	. 79	. 72	. 07	13. 20
15-----	3. 26	11. 18	12. 76	1. 06	. 98	. 08	13. 74
16-----	2. 82	12. 43	13. 82	. 64	. 64	. 00	14. 46

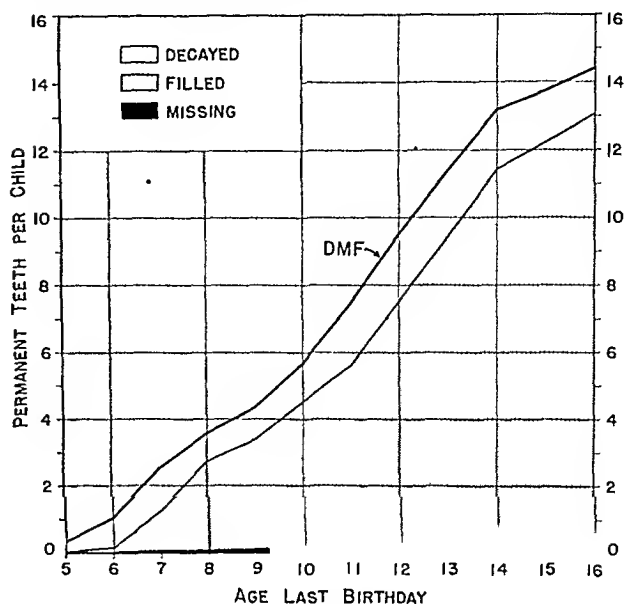
<sup>1</sup> Includes teeth carious only, those both carious and filled, and those indicated for extraction. <sup>2</sup> Based on actual number of teeth carious, filled, or carious and filled. Teeth that are both carious and filled are counted only once. <sup>3</sup> Decayed, missing, and filled. <sup>4</sup> Average of the rates for ages 5-16.

Figure 1. Dental caries prevalence in permanent teeth, third treatment series, Woonsocket, R. I., ages 5-16.



Waterman and Knutson (2) point out in a report on a comparable study project in Richmond, Ind., that "continued reduction of the number of teeth indicated for extraction reflects the regularity of complete care during the previous treatment series." This indication of the value of complete and continuing care in saving teeth is supported by the Woonsocket experience. More than 10 times as many permanent teeth per child were indicated for extraction at the start of the first series as in the fourth series (table 3). During the same interval the number of teeth that had been extracted decreased by more than 50 percent. Eleven percent of the children in the fourth series had 1 or more

Figure 2. Dental caries prevalence in permanent teeth, fourth treatment series, Woonsocket, R. I., ages 5-16.



extracted teeth, compared with 22 percent in the first.

Initial examination findings revealed that 47 percent of all primary teeth were carious. In addition, only 4 percent of the children had 1 or more primary teeth which had been filled prior to the first treatment series. Improvement in the status of the primary dentition was observed with each succeeding treatment series. The proportion of decayed primary teeth, for example, decreased to 33 percent in the fourth series, whereas that of children with filled primary teeth increased to 36 percent. For the first three series the average number of carious primary teeth per child was highest in 6-year-

Table 3. Average dental caries prevalence in permanent teeth of children aged 5-16, four treatment series, Woonsocket, R. I.

[Number of teeth per child]

Treatment series	Caries	Filled	Caries and/or filled	Missing			DMF <sup>1</sup>
				Total	Extracted	Extraction indicated	
1	6.39	1.32	7.09	0.99	0.66	0.33	7.76
2	5.30	3.87	7.84	.77	.66	.11	8.50
3	3.37	5.19	7.54	.47	.43	.04	7.97
4	2.28	5.63	6.98	.33	.30	.03	7.28

<sup>1</sup> Decayed, missing, and filled.

**Table 4. Dental caries prevalence in primary teeth of children, third and fourth treatment series, Woonsocket, R. I.**

[Number of teeth per child]

Age last birthday	Carious <sup>1</sup>	Filled	Carious and/or filled <sup>2</sup>	Extractions indicated
Third treatment series				
5-16 <sup>3</sup>	2. 21	0. 68	2. 73	0. 36
5-----	5. 95	. 63	6. 38	. 63
6-----	6. 19	. 71	6. 64	1. 02
7-----	4. 62	1. 87	6. 08	. 78
8-----	3. 18	2. 51	5. 24	. 50
9-----	2. 85	1. 54	4. 08	. 50
10-----	2. 03	. 66	2. 50	. 43
11-----	1. 11	. 21	1. 27	. 27
12-----	. 36	. 06	. 39	. 10
13-----	. 08	. 01	. 09	. 04
14-----	. 05	. 00	. 05	. 01
15-----	. 02	. 01	. 02	. 01
16-----	. 05	. 00	. 05	. 05
Fourth treatment series				
5-16 <sup>3</sup>	2. 04	1. 04	2. 84	. 24
5-----	6. 91	. 69	7. 35	. 79
6-----	5. 78	1. 18	6. 62	. 67
7-----	3. 67	3. 04	6. 08	. 45
8-----	2. 56	3. 21	5. 20	. 30
9-----	2. 36	2. 59	4. 37	. 19
10-----	1. 74	1. 20	2. 64	. 21
11-----	. 91	. 40	1. 20	. 10
12-----	. 37	. 10	. 43	. 06
13-----	. 11	. 03	. 13	. 03
14-----	. 04	. 02	. 05	. 00
15-----	. 02	. 01	. 03	. 05
16-----	. 00	. 00	. 00	. 64

<sup>1</sup> Includes teeth carious only, those both carious and filled, and those indicated for extraction. <sup>2</sup> Based on actual number of teeth carious, filled, or indicated for extraction. <sup>3</sup> Average of the rates for ages 5-16.

old children, whereas in the four 5-year-old group had the highest (4). At the beginning of the program children averaged 0.99 filled primary teeth per child in the fourth series. However, this figure increased to 3.21 primary teeth per child by the end of the fourth series. Only children aged 10 years or older in the fourth series could have received dental care in the three preceding rounds. To evaluate the improvement in dental status resulting from regular care, one may compare the dental status at the initial and the fourth examination.

14-year-old children, recognizing at the same time that the group involved in the fourth series also included newly enrolled individuals. At the beginning of the program the average 10-year-old had 5.30 carious, 0.83 filled, and 0.61 missing permanent teeth. In the fourth treatment series, on the other hand, the corresponding averages for children of the same age were 2.06, 1.35, and 0.19. These figures indicate that 10-year-old children in the fourth series had less than half as many carious, five times as many filled, and one-third as many missing permanent teeth as those of similar age in the first series.

Similarly, initial examination of the 14-year-old group showed 10.7 carious, 2.91 filled, and 2.21 missing permanent teeth per child. By contrast, the average 14-year-old in the fourth series had 3.65, 10.66, and 0.79 teeth in the carious, filled and missing categories, respectively. This represented one-third as many decayed, nearly four times as many filled, and one-third as many missing permanent teeth as were observed in children at the start of the program.

Third treatment series						
5-16 <sup>3</sup>	7. 54	0. 47	0. 43	0. 04	7. 97	
5-----	. 66	. 00	. 00	. 00	. 66	
6-----	1. 70	. 01	. 00	. 01	1. 70	
7-----	2. 98	. 04	. 02	. 02	3. 00	
8-----	3. 72	. 06	. 03	. 03	3. 75	
9-----	4. 58	. 17	. 13	. 04	4. 71	
10-----	5. 88	. 25	. 20	. 05	6. 08	
11-----	7. 97	. 24	. 21	. 03	8. 18	
12-----	10. 42	. 52	. 46	. 06	10. 88	
13-----	12. 03	. 62	. 57	. 05	12. 60	
14-----	12. 93	. 90	. 86	. 04	13. 79	
15-----	13. 87	1. 36	1. 24	. 12	15. 11	
16-----	13. 73	1. 50	1. 41	. 09	15. 14	
Fourth treatment series						
5-16 <sup>3</sup>	2. 28	5. 63	6. 98	0. 33	0. 30	0. 03
5-----	. 31	. 00	. 31	. 00	. 00	. 31
6-----	. 94	. 14	1. 04	. 00	. 00	1. 04
7-----	1. 62	1. 22	2. 52	. 03	. 02	. 01
8-----	1. 47	2. 67	3. 56	. 06	. 05	. 01
9-----	1. 72	3. 31	4. 28	. 09	. 07	. 02
10-----	2. 06	4. 35	5. 52	. 19	. 16	. 03
11-----	2. 87	5. 42	7. 26	. 22	. 20	. 02
12-----	3. 37	7. 23	9. 27	. 32	. 27	. 05
13-----	3. 28	8. 93	10. 90	. 52	. 47	. 05
14-----	3. 65	10. 66	12. 48	. 79	. 72	. 07
15-----	3. 26	11. 18	12. 76	1. 06	. 98	. 08
16-----	2. 82	12. 43	13. 82	. 64	. 64	. 00

<sup>1</sup> Includes teeth carious only, those both carious and filled, and those indicated for extraction. <sup>2</sup> Based on actual number of teeth carious, filled, or indicated for extraction. <sup>3</sup> Average of the rates for ages 5-16.

**Table 5. Dental treatment to permanent and primary teeth of children, third and fourth treatment series, Woonsocket, R. I.**

[Number of teeth per child]-

Age last birthday	Permanent teeth			Primary teeth		
	Filled	Filled surfaces	Extracted	Filled	Filled surfaces	Extracted
Third treatment series						
5-16 <sup>1</sup> -----	3. 24	4. 90	0. 07	0. 88	1. 76	0. 42
5-----	. 62	. 91	. 00	3. 72	7. 59	. 68
6-----	1. 65	2. 54	. 01	3. 64	7. 30	1. 08
7-----	2. 50	3. 90	. 03	2. 32	4. 56	. 87
8-----	2. 00	3. 07	. 03	. 80	1. 56	. 58
9-----	2. 05	3. 20	. 05	. 06	. 11	. 57
10-----	2. 59	3. 72	. 07	. 01	. 01	. 53
11-----	4. 15	5. 72	. 07	. 01	. 01	. 41
12-----	5. 22	7. 51	. 12	. 00	. 00	. 22
13-----	5. 50	8. 12	. 08	. 00	. 00	. 08
14-----	4. 40	6. 76	. 08	. 01	. 02	. 04
15-----	4. 76	7. 50	. 15	. 00	. 00	. 04
16-----	3. 41	5. 91	. 09	. 00	. 00	. 05
Fourth treatment series						
5-16 <sup>1</sup> -----	2. 19	3. 48	0. 05	0. 84	1. 82	0. 32
5-----	. 30	. 43	. 01	3. 71	8. 24	. 90
6-----	. 95	1. 38	. 00	3. 41	7. 49	. 78
7-----	1. 60	2. 43	. 01	1. 95	4. 03	. 53
8-----	1. 45	2. 22	. 02	. 88	1. 85	. 40
9-----	1. 69	2. 64	. 03	. 07	. 16	. 31
10-----	2. 00	2. 96	. 04	. 01	. 02	. 34
11-----	2. 81	4. 08	. 03	. 00	. 00	. 21
12-----	3. 31	5. 91	. 07	. 00	. 00	. 15
13-----	3. 14	4. 90	. 06	. 00	. 00	. 07
14-----	3. 49	5. 93	. 15	. 00	. 00	. 06
15-----	2. 91	4. 96	. 11	. 00	. 00	. 03
16-----	2. 68	3. 96	. 04	. 00	. 00	. 00

<sup>1</sup> Average of the rates for ages 5-16.

number of children on a maintenance basis upon completion of the first treatment series. The practicability of this approach is suggested by the continued decrease in primary teeth indicated for extraction in succeeding treatment series. Each primary tooth filled involved an average of 2 surfaces, compared with 1.5 surfaces for each permanent tooth. This pattern showed little variation throughout the program.

Additional treatment included 754 pulp cappings and 94 vital partial pulpectomies in permanent and primary teeth during the third round. The corresponding numbers for the fourth series were 815 and 86.

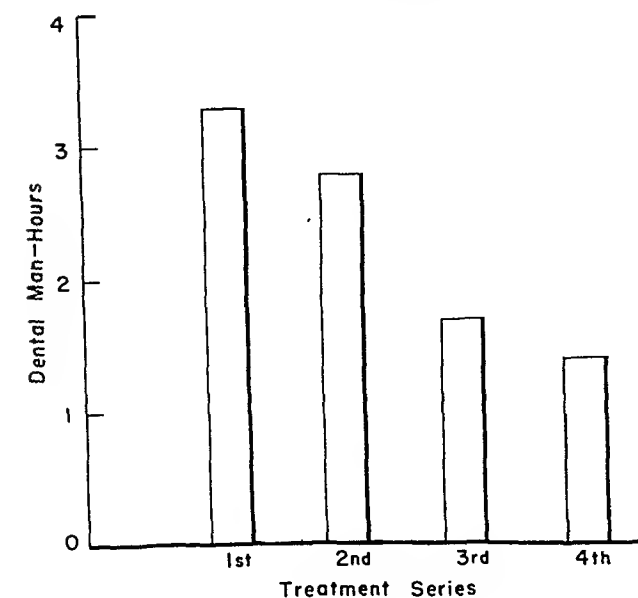
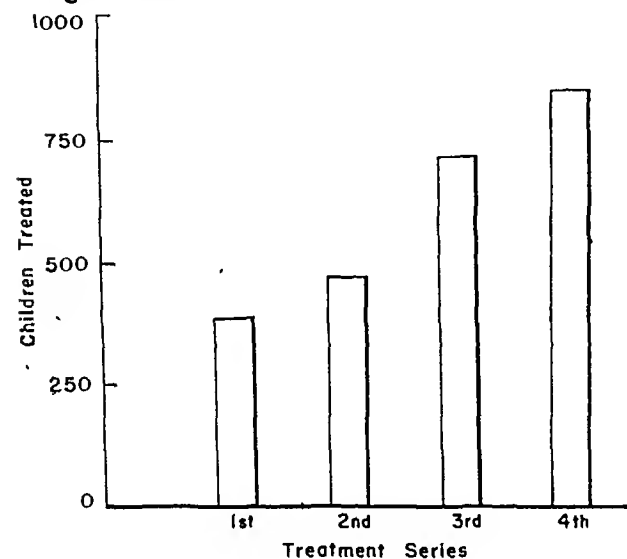
#### Dentist Man-Hours

During the 15 months required to complete the third treatment series, an average of 5.5 dentists were on duty, or a ratio of 1 dentist to 714 children per year. Complete treatment of each child required 1.7 dentist man-hours. An average of 1.9 permanent and 0.6 primary teeth were filled per dentist man-hour in addition to the miscellaneous treatments provided. During the fourth series, 5,004 children were treated by an average of 5.9 dentists, a ratio of 1 dentist to 848 children per year. During this series an average of 1.4 dentist man-hours was required for each completed case. For each dentist man-

hour, an average of 1.6 permanent and 0.7 primary teeth were filled. Table 6 summarizes the ratio of clinic to nonclinic patients; children treated per dentist; dentist man-hours per child; and teeth filled per dentist man-hour during the four series.

The number of teeth filled per dentist man-hour remained essentially constant in all four rounds. The effect of regular, complete dental care in reducing the needs for dental service is indicated by the increased number of children treated annually per dentist and the decrease in

**Figure 3. Children treated annually per dentist and dental man-hours per completed case, four treatment series, Woonsocket, R. I., ages 5-16.**



**Table 6. Selected comparative data for the four treatment series, Woonsocket, R. I., children aged 5-16**

Comparative data	Treatment series			
	1	2	3	4
Patients-----	6,848	6,107	5,975	6,201
Clinic-----	5,944	5,189	4,912	5,004
Nonclinic-----	904	918	1,063	1,197
Children treated per dentist-----	384	470	714	848
Dentist man-hours per child-----	3.3	2.8	1.7	1.4
Teeth filled per dentist man-hour-----	2.4	2.6	2.5	2.3
Permanent-----	2.1	1.9	1.9	1.6
Primary-----	.3	.7	.6	.7

dentist man-hours required to complete each case (fig. 3 and table 6). This continued reduction in need was also reflected in a steady decline in the overall time required to complete succeeding treatment series.

#### Summary of All Four Series

Over 80 percent of the total enrollment in kindergarten through the ninth grade, or an average of 5,100 school children, received complete dental care in each of the four treatment series of the Woonsocket dental care study. In addition, a small number participated to the extent of receiving partial clinic care. Six percent of the children were cared for regularly by their own dentists, whereas about 10 percent sought no care from any source.

The initial examination disclosed an average of 6.39 carious, 1.32 filled, and 0.99 missing permanent teeth per child for all age groups 5-16 years. During the fourth treatment series the corresponding rates were 2.28, 5.63, and 0.33 teeth per child.

Although care of the primary teeth was selective rather than complete, the filled tooth rate per child for children aged 5-8 years increased from an average of 0.19 teeth in the first series to 2.49 in the final series.

The effect of regular, complete dental treatment in reducing dental needs is indicated by the greater number of children treated annually per dentist, as well as by the decreased dentist

time required to complete each case. Whereas each dentist cared for 384 children during a year in the first series, he was able to extend his services to 848 patients by the fourth round. Only 1.4 dentist man-hours were needed to complete treatment per child in the final series, in contrast to the 3.3 man-hours in the first series. This figure includes the time required to care for the backlog needs of newly enrolled children who had not previously been treated in the program.

The number of months devoted to completing

each of the treatment series was 30, 24, 15, and 12, respectively.

#### REFERENCES

- (1) Law, F. E., Johnson, C. E., and Knutson, J. W.: Studies on dental care service for school children—First and second treatment series, Woonsocket, R. I. Pub. Health Rep. 68: 1192-1198, December 1953.
- (2) Waterman, G. E., and Knutson, J. W.: Studies on dental care services for school children—Third and fourth treatment series, Richmond, Ind. Pub. Health Rep. 69: 247-254, March 1954.

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## *An Important Date*



Each month your health department and many hospitals, laboratories, schools, clinics, and homes receive a copy of PUBLIC HEALTH REPORTS, mailed to arrive on the 20th, or even earlier, depending upon geographic location of the subscriber.

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### *Scheduled for early publication*

Venereal Disease in Teen-agers  
Ownership of Nursing Homes  
The Trachoma Story  
Medical Librarianship  
A Rural Sanitation Program  
Hospital Beds in the United States



# research progress report

## Germ-Free Amebiasis Studies

*This report on progress of germ-free amebiasis research being conducted by the University of Notre Dame and the Public Health Service is based on a paper presented by Bruce P. Phillips at the annual meeting of the American Society of Parasitologists, at Memphis, Tenn., November 4, 1954. Mr. Phillips is a medical protozoologist with the National Microbiological Institute of the Service.*

CONVENTIONAL animal experimentation as a key resource in the study of infectious diseases has certain inherent shortcomings. Among them are interference by rival organisms in the animal. An investigator working with a given disease organism in a laboratory animal usually must consider the possible effects of other micro-organisms normally present or accidentally introduced. He must ask if his results are influenced, directly or indirectly, by bacteria normally harbored by the animal, bacteria which in themselves do not ordinarily produce disease.

### Germ-Free Animals

To eliminate such uncertain or unpredictable factors is the object of what is known as germ-free medical research. For this work, great pains have been taken to rear and make available for experimental use small laboratory animals—chickens, guinea pigs, or mice—which are free of the bacteria harbored by conventional or “contaminated” animals.

Scientists first attempted to rear germ-free animals—chickens—in 1897. Contamination occurred within the first few days. The investigators concluded that it is practically impos-

sible to free the egg surface from bacteria, and that chickens are therefore unsuitable for germ-free studies. Nevertheless, another scientist, Schottelius, persevered. After 9 years, he reported, he raised about 30 germ-free birds; some remained germ-free for as long as 30 days. But his germ-free birds sickened and died, whereas others which he deliberately contaminated after a short period developed normally. He concluded that intestinal bacteria are indispensable to the nutrition of vertebrates.

Soon after, these conclusions were refuted. Cohendy in 1912 reported rearing 17 healthy germ-free chickens for as long as 40 days.

After a lapse of nearly 25 years, Balzam in 1937 reported he had reared 5 healthy chickens for 59 days, germ-free, for an experiment with nutrition. He concluded that intestinal bacteria had no appreciable influence on the digestibility of food in the chicken.

Chickens have proved particularly appropriate for germ-free breeding. The chick feeds itself from birth. It needs fewer caretakers than the mammals. Advanced knowledge of its genetic and embryonic history is also an advantage to research.

The first long-term program to rear germ-free animals began in 1928 at the University of

Notre Dame. This attempt to resolve the many complex problems of creating and maintaining a sterile environment for germ-free animals drew on resources of mechanics, engineering, physics, chemistry, and biology. The bacteriological triumph gave rise to a specialty known as biological engineering, which designed the instruments and apparatus of the project. Only by these applied skills was it possible to put germ-free animal breeding on a practical basis. Trained technicians were enabled by ingenious equipment to relieve highly trained research personnel of the routine feeding and management of the animals.

The objective at Notre Dame was to introduce an animal, germ-free at birth, into a sterile environment, and to maintain it and its progeny germ-free. The feat required that the animal be isolated from germs in its living quarters, its air, its food, and all its other contacts.

Early attempts to achieve this end depended on a series of steps, each using germ-free apparatus with aseptic technique. Since any one step was a weak link in the chain, Notre Dame devised a system of total control. The entire apparatus for moving the animals, cleaning cages, and handling food is sterilized at one time under steam pressure.

This achievement at Notre Dame, under the leadership of Dr. James A. Reyniers, has been followed with deep interest by scientists in many research institutions. At the National Institutes of Health of the Public Health Service, the availability of germ-free animals led to the initiation of a study 2 years ago by the National Microbiological Institute's Laboratory of Tropical Diseases, in cooperation with the University of Notre Dame.

### **Amebiasis Study**

The problem selected for study at the National Institutes of Health was a widespread intestinal infection known as amebiasis. Many will remember the serious outbreak of this disease in Chicago during the World's Fair 20 years ago. Amebic infection is common in the United States. It is found in an estimated 7 percent of our population.

Amebic dysentery has long been viewed as a clinical anomaly, in that it presents an unusually

wide and varied range of manifestations. To explain these variations, studies were devised to investigate the agent of this disease and its capacity to produce infection. Among them have been studies to determine the effects of inoculation of germ-free animals with amebas which are themselves free of bacterial contamination.

### **Germ-Free Amebas**

These studies were proposed because the initial attack of this disease agent usually occurs in the lower intestinal tract, where it lives with a large number of species of bacteria. It had never been possible for the ameba to be grown in the test tube without the presence of bacteria until a scientist in the National Microbiological Institute succeeded in cultivating the ameba in bacteria-free cultures of a South American trypanosome.

Two groups of animals were used for inoculation with the germ-free ameba: germ-free guinea pigs and conventional guinea pigs. Both groups were maintained on identical sterilized rations.

None of the 35 germ-free animals developed amebic lesions before they were sacrificed on the 33d day. Of the 37 conventional animals inoculated as controls, 34 developed ulcerative amebic disease, and the remaining 3 were shown to harbor the infecting agent when sacrificed on the 21st day.

In contrast to these results, 2 series of pre-experimental germ-free animals were fed by mouth single species of common intestinal bacteria before being inoculated with bacteria-free ameba. All of these animals developed acute amebic diseases with typical lesions.

### **Bacterial Effect**

These results offered first concrete evidence that bacteria have a role in the experimental production of disease by the ameba. In relation to amebic disease in humans, the evidence suggests a possible explanation for the disparities frequently noted in clinical manifestations and in effects of treatment of amebic dysentery.

This study, made possible by the use of Notre Dame's germ-free animals and facilities, repre-

sented an expenditure by the National Institutes of Health of only \$21,000.

The National Microbiological Institute, the National Institute of Arthritis and Metabolic Diseases, and the National Institute of Dental Research have plans for additional germ-free studies.

At the Microbiological Institute, new knowledge is sought about the multitude of infecting agents that assault the tissues of man. Germ-free studies aid in this task, for they supply a method and a freedom from bacterial interference heretofore lacking.

Germ-free animals may be useful in investigating the site of multiplication of the poliomyelitis virus in the intestinal tract and the influence on its multiplication and excretion.

Another project would study resistance of germ-free animals to infection with such agents as staphylococci. This is of interest to clinical medicine because staphylococci, once they become resistant to antibiotic drugs, may cause severe complicating secondary infections.

Other studies may determine whether certain fungi and yeasts become pathogenic, or disease producing, if the effect of bacterial growth in the respiratory and gastrointestinal tracts is eliminated.

The hope is that germ-free techniques have reached the stage where they can be applied to the study of a wide variety of complex biological problems, as evidenced 70 years ago by Pasteur.

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## **New Juvenile Delinquency Division in Children's Bureau**

With the establishment of a Division of Juvenile Delinquency, the Children's Bureau of the Department of Health, Education, and Welfare will increase its services to public and private agencies and to organizations concerned with the nationwide problem of juvenile delinquency. The new division will work closely with existing programs of the Children's Bureau to extend and improve its health and welfare services for physically, socially, and emotionally handicapped children.

Philip Gordon Green, former chief juvenile probation officer of the Juvenile Court of San Francisco, will direct the division. Associated with him will be William H. Sheridan as chief of the Technical Aid Branch, Mrs. Elliot Turner Studt as chief of the Training Branch, and Donald George Blackburn as consultant on institutions for delinquent youth. Specialists on juvenile police, courts and probation services, and community services are to be appointed.

The Children's Bureau is also expanding its study program and statistical reporting on children who come to the attention of the courts.

# Roof Rats in Southwest Georgia

Two rodent species of the genus *Rattus* (*R. norvegicus* and *R. rattus*) have played important roles in the transmission of some of the earth's most serious diseases. The control of these rodents and of their ectoparasites has proved an effective means of combating these diseases. However, efficient control of rodents and/or their ectoparasites requires a thorough understanding of the animal's life history and habits.

Many good studies have contributed to a sound understanding of Norway rat populations, but the works are few which analyze the population dynamics of roof rats. The Georgia studies made efforts to increase understanding of the phenomena of the habits and population of roof rats. It is hoped that the reported findings will lead to more efficient control of roof rats and to a greater reduction in the diseases transmitted by this species.

The objectives of the study were (1) to determine the basic population units and the factors responsible for their well-being, (2) to develop methods for observing and detecting changes in density of rat populations, (3) to analyze mortality rates from catch-mark-release data, (4) to determine movement rates and distances traveled, and (5) to learn the extent to which rats maintain a feral existence.

The study was conducted in Brooks, Thomas, and Grady counties, Ga., from June 1951 through January 1953. Rats were live-trapped, marked, and released in five rural study areas. Trapping and marking methods are described. Some additional data were gathered from the steel trapping records of murine typhus surveillance programs.

Typical habitat and basic living requirements are described. Population changes are analyzed by comparison of trap-catch rates, by change in colony distribution, by farmer and

trapper recollection, and by changes in age distribution. All methods of analysis point in the direction of a reduced rat population between 1947 and 1953.



Public Health

MONOGRAPH

No. 27

The accompanying summary covers the principal findings presented in Public Health Monograph No. 27, published concurrently with this issue of Public Health Reports. The author, formerly a wildlife research biologist with the Public Health Service Communicable Disease Center, is a public health biologist with the Santa Clara County (Calif.) Health Department.

Readers wishing the data in full may purchase copies of the monograph from the Superintendent of Documents, United States Government Printing Office, Washington 25, D. C. A limited number of free copies are available to official agencies and others directly concerned on specific request to the Public Inquiries Branch of the Public Health Service. Copies will be found also in the libraries of professional schools and of the major universities and in selected public libraries.

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Ecke, Dean H.: Roof rat populations in southwest Georgia. Public Health Monograph No. 27 (Public Health Service Publication No. 373). 20 pages. Illustrations. U. S. Government Printing Office, Washington, D. C., 1955. Price 20 cents.

Mortality rates computed from retrapping data show that females live longer than males, and that over 95 percent of any given population could be expected to die within 12 months. A distinction is made between "disappearance rates" as directly observed in trapping records and "true mortality" rates. It is also shown that males attain greater size than females.

Rat movement was found to be quite restricted. Of 546 rats retrapped, only 4 were taken at distances greater than 500 yards from

their original capture site. Twelve percent of captured rats moved between buildings at distances under 300 yards, and individual moves over 100 yards were rare.

No evidence could be found to substantiate local beliefs that rats migrated between fields and farm buildings during seasonal changes. Data from field trapping, absence of rat sign in fields, and stomach analyses of foxes combine to discount any appreciable population of feral rats in the vicinity of study.

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## technical publications

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### A Comprehensive Program for Water Pollution Control

#### The Minnesota River Basin

*Public Health Service Publication No. 365 (Water Pollution Series No. 64). 1954. 26 pages; map and tables.*

#### The Rainy River Basin

*Public Health Service Publication No. 380 (Water Pollution Series No. 68). 1954. 6 pages; map and tables.*

The Minnesota River Basin and the Rainy River Basin pollution control programs are summarized in these two publications of the water pollution control series.

The Minnesota River Basin consists of a watershed area of about 16,920 square miles, located in southwestern Minnesota, South Dakota, and Iowa. The principal tributaries are the Little Minnesota, Chippewa, Cottonwood, Redwood, Lac Qui Parle, Pomme de Terre, and Yellow Medicine Rivers. To protect the water of the basin against pollution, the report recommends construction of 64 new or enlarged municipal sewage treatment plants to serve about 100,000 people, plus new or improved waste treatment facilities at 19 industrial plants.

The water pollution control program for the Minnesota River Basin has been developed jointly by the water pollution control agencies of Iowa, Minnesota, and South Dakota with the cooperation of Federal water pollution agencies.

The Rainy River Basin lies in Ontario and in the north central part of Minnesota. The river forms a portion of the boundary between Canada and Minnesota and drains an area of approximately 21,000 square miles, 11,300 of which are in Minnesota.

The water pollution control program for the portion of the Rainy River Basin within the United States has been developed and put into operation by the Water Pollution Control Agency of Minnesota, which had the cooperation of other authorities during the planning period.

### Health Manpower Source Book

#### Medical Record Librarians

*Public Health Service Publication No. 263. Section 6, 1954. By Maryland Y. Pennell, Marion E. Altenderfer, and Olive G. Johnson. 43 pages; tables. 30 cents.*

This sixth section of the health manpower source book series pre-

sents data on the number, characteristics, and distribution of medical record librarians. A survey by the American Association of Medical Record Librarians in 1953 gave information on employment status and educational background. Additional material was obtained from the association files and from the approved schools for the training of medical record librarians.

About 13 percent of the active medical record librarians have been graduated from approved schools for training in that field. In 1953-54, the 24 approved schools had a student capacity of 219 and an enrollment of 114. Of the 1,152 persons graduated from accredited schools during the period 1928-53, almost half are currently active in their profession.

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This section carries announcements of all new Public Health Service publications and of selected new publications on health topics prepared by other Federal Government agencies.

Publications for which prices are quoted are for sale by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. Orders should be accompanied by cash, check, or money order and should fully identify the publication. Public Health Service publications which do not carry price quotations, as well as single sample copies of those for which prices are shown, can be obtained without charge from the Public Inquiries Branch, Public Health Service, Washington 25, D. C.

The Public Health Service does not supply publications issued by other agencies.

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*The twin problem of encouraging foreign trade while protecting the health of the Nation . . . Shellfish, in the shellfish sanitation control program of the Public Health Service, are defined as "fresh or frozen oysters, clams, and mussels."*

# Shellfish Importation into the United States

By RICHARD S. GREEN, M.S.

IMPORTATION of shellfish presents several complex sanitation problems to health and food control officials, as well as to industry. The program of shellfish sanitation control of the Public Health Service is based on the endorsement of State operations. The listing of certified dealers in a periodic compilation, designed for use in consumer areas, is the backbone of this voluntary system of control. Since 1948, Canada and the United States have operated under an agreement to use this technique for shellfish shipped across the border.

The acceptance of this concept of the certification system and an understanding of the health department surveillance involved in it brought about demands for similar attention to the growing volume of shipments of shellfish from other countries. Since many health services in the United States require that oysters, clams, and mussels be purchased from certified

dealers, shipments from foreign countries other than Canada have found a restricted market, even though they have been admitted legally to the country under the terms of the Federal Food, Drug, and Cosmetic Act (1). The Food and Drug Administration is responsible for permitting or denying entry to food imports under that act.

Representatives of foreign countries and United States importers have asked the Public Health Service how their shellfish can be accepted in a manner similar to domestic and Canadian shellfish. At the same time, State and local health departments have asked the Service what they should do about foreign shellfish which have appeared on the market. The Public Health Service, although it has guided the domestic control program for many years, has no legal jurisdiction in this issue. Since the shellfish sanitation program was developed, and still functions, through cooperation among the States, industry, and the Public Health Service, major adjustments in the program must be worked out by agreement among these interested parties.

As indicated above, responsibility for permitting or denying entry of shellfish shipments when presented at ports of entry, under the terms of the Food, Drug, and Cosmetic Act, lies with the Food and Drug Administration, a companion agency of the Public Health Service in the Department of Health, Education, and

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*Mr. Green, chief of the Shellfish Branch from July 1947 to November 1954, is now chief of the Facilities Protection Project, Water Supply and Water Pollution Control Program, Division of Sanitary Engineering Services, Public Health Service. This paper is based on comments presented at the Joint Convention of the Oyster Institute of North America and the National Shellfisheries Association, Boston, August 4, 1954.*

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Welfare. Whenever the Food and Drug Administration finds, from the examination of samples, or otherwise, that such shipments of shellfish are insanitary, adulterated, or misbranded, their entry is refused. In the absence of such evidence, entry must be permitted.

### The Concept of Control at Source

It is generally agreed that, in the instance of oysters, clams, and mussels, protection of the consumer is best assured by sanitary controls over conditions attending the growing, harvesting, packing, and shipping of the shellfish. This principle of "control at source" has governed the cooperative domestic shellfish program of the Public Health Service, the States, and industry. It is employed also in the agreement with Canada. Its value may be judged by the low incidence of shellfish-borne enteric disease, despite the more than 400 polluted areas on our coastlines that are legally closed to shellfish harvesting.

Objective examination of samples collected from foreign shellfish shipments on their arrival at an American port does not always give satisfactory evidence as to the conditions under which the shellfish were produced and packed. It is, therefore, difficult to decide which shipments should be admitted and which denied entry, particularly when bacteriological findings do not show presence of significantly large numbers of coliform organisms, and when other objective findings are satisfactory.

Prior to World War II, few shipments of shellfish came into the United States except from Canada and Mexico. Most of the shipments from Mexico were pismo clams (*Tivela stultorum*), although an occasional shipment of shucked oysters was offered for entry. In 1952 somewhat over a half million pounds of clam meats were imported from Mexico, principally through the San Diego and Los Angeles ports of entry. In 1953 this figure was close to three-fourths of a million pounds. It is believed that almost all of these clams are used in production of heat-processed clam chowder; since no apparent attempt has been made to distribute unprocessed clams beyond the State of entry, the question of certification of clam producers in Mexico has not arisen.

With expansion of the frozen food industry since the end of World War II, several other foreign countries have developed an interest in the United States market for bivalve shellfish, principally frozen clams. Japan, Iceland, Australia, The Netherlands, France, Spain, China, and Panama have all exported or indicated an interest in exporting frozen clams, mussels, or oysters to the United States. The total volume of shellfish shipped here has been relatively small, somewhere in the neighborhood of 1 or 2 percent of domestic production. However, foreign shellfish, except those produced in Canada, have been faced with the restrictions resulting from lack of certification. It is uncertain what the ultimate volume of shellfish imports might be if such restrictions were overcome.

### The Case for International Trade

Although it is outside the usual field of public health to dwell on such facts as dollar exchange value, tariffs, and the importance to these foreign governments of trade with the United States, these factors bear directly on the regulatory problem. Specialists in such matters have analyzed the situation about as follows:

International trade in frozen shellfish, thanks to technical advances, is now possible on a worldwide basis. Producers of shellfish in distant countries are eager to help to satisfy what appears to be an expanded demand for shellfish in the United States. The interest of foreign governments stems from the importance of trade to their national economies and the importance that all free world countries attach to close ties with the United States. It is held to be in our interest to foster such ties and to enable friendly countries to gain strength through trade. Their welfare and ours are said to require that they be able to earn dollars from their exports to the United States in order to buy the products of our farms and factories.

Japan and Iceland, in particular, must sell the United States more goods than they now do to pay for American products they need and want. Iceland has virtually nothing except marine products to sell abroad, and marine products are among the few commodities which

Japan can produce without the use of imported raw materials.

In the last few years, the Governments of Iceland, Japan, The Netherlands, and Australia have made known to the Department of State and to the Public Health Service their interest in working out some arrangements which would remove unnecessary restrictions against the marketing of imported shellfish without endangering public health. As the Department of State has asserted America's interest in this problem, the Public Health Service has examined available facts with respect to the issue of expanding the present system of certification to these and other foreign countries.

The Public Health Service does not want its cooperative system of shellfish sanitation control within the United States to act as an artificial trade barrier against legitimate shellfish shipments which have been produced and packed under conditions equal to those required of American packers. On the other hand, even if the Public Health Service had the authority to do so—which it does not—there are difficulties in extending this certification system to other countries. Full knowledge of these difficulties is necessary in order to deal with the problem intelligently.

### **The Complexity of Foreign Control**

Public Health Service endorsement of State shellfish sanitation programs presumes that representatives of the Service keep in close touch with control measures of the individual producing States by reasonably frequent consultations with State personnel, cooperative investigations, and check inspections. Without this kind of contact, the Public Health Service could not report adequately to the country as a whole on the effectiveness of the local procedures. The agreement with Canada specifically includes provisions for the exchange of information on methods of production and handling of shellfish, and for inspection visits across the border.

From a practical point of view, it has been easy for the Public Health Service to meet these provisions of the agreement with Canada. The capitals of the two countries are only a few hours apart by air, and long distance telephone conversations are relatively inexpensive.

It costs the United States Government a very small sum each year to keep in close touch with operations in the Canadian Maritime Provinces of eastern Canada and in British Columbia, by extending routine field trips to those areas while Public Health Service inspectors are working in the State of Maine or the State of Washington. Health officials in the two countries have many mutual concerns; thus, official business easily includes shellfish sanitation along with other topics, and a constant interchange of information is possible at relatively low cost. In addition, cooperative efforts with Canada have been built on a long history of parallel development in the two countries, both as to technical procedures and administrative operations.

There are no provisions in the Food, Drug, and Cosmetic Act which would make possible routine international exchange of information about techniques of sanitation control at source. There is no provision for setting up any plan of international certification or endorsement of any foreign control program. In the view of officials of the Food and Drug Administration, the only justification under the Food, Drug, and Cosmetic Act for that Administration to use its appropriated funds to send a representative to a foreign country would be to gain information considered necessary for the proper enforcement of the act in connection with foods or drugs offered for entry into the United States.

Such visits have been rare for various reasons. In the first place, a single trip to a foreign country for inspection purposes can develop information of only limited usefulness. In order to carry out the type of inspections performed in this country under authority of the Federal Food, Drug, and Cosmetic Act, it is sometimes necessary to visit one or more plants several times during the year. Because of limitations of funds and personnel, such trips to foreign countries have limited value for control purposes. Compared with the expenditure on inspections in this country, they are also uneconomic, although occasions may arise when a single trip or visit to a foreign country may supply basic information necessary to evaluate a particular situation.

Aside from the complicated administrative problems, certain other factors are important.

There are limitations to the objective ex-



amination of shellfish at the time of arrival of shipments in this country. If strongly positive bacteriological results are obtained, one may assume that the shellfish were produced or handled under insanitary conditions. However, when bacteriological results are negative, interpretation becomes much more difficult.

In spite of a great deal of research, there has not been established for even our own species of shellfish any firm relationship between bacterial content of shucked shellfish in the market and the quality of growing areas and conditions of handling. This is why it is not yet possible to adopt a final bacteriological standard for market quality. Work which has been done so far in this field has dealt chiefly with fresh shucked oysters and clams and has not considered frozen products. Undoubtedly, the freezing and prolonged storage of shellfish produced abroad will have some effect on their apparent bacterial content.

In the United States and Canada, certain species of shellfish, notably clams and mussels, are sometimes subject to the accumulation of organic toxins. The origin and action of these toxins are fairly well understood, and a complex administrative control program is in operation to prevent toxic shellfish from being used commercially. Adequate test procedures are available and are being improved. However, there is some reason to believe that toxin which sometimes affects certain species of foreign shellfish may not be so well understood, and it is not certain that adequate tests have been developed.

Most of the frozen shellfish which would be shipped to the United States would be cooked before use. In fact, one importer has been investigating the feasibility of introduc-

ing clams which would be given some cooking before being frozen for shipment, this product being intended for use as chowder stock. It is unlikely that many frozen shellfish from abroad would be consumed raw. This factor is mentioned, not because there should be any significantly different standards applied to shellfish intended to be heat processed before sale but simply because the facts seem to indicate that any health hazard which might be present in connection with bacterial contamination of frozen shellfish from abroad would be considerably reduced by cooking. However, this expected heat treatment should not be employed in any way as a coverup for a filthy item. The Food and Drug Administration and the Public Health Service both hold this position.

There are in operation two parallel mechanisms of sanitary control for imported shellfish. One admits shellfish to this country, and, at the same time, the other restricts their market. Foreign governments find it difficult to understand that two different sources of legal authority in the United States, one Federal and one State, govern the importation and the marketing, respectively.

After a free exchange of views at the National Conference on Shellfish Sanitation, September 9 and 10, 1954, industry and government representatives agreed that recommendations on the significance of traffic in imported shellfish should come from the State Department. The State Department continues to study the developing trends of this commerce.

#### REFERENCE

- (1) Food, Drug, and Cosmetic No. 1, Revision 4; 21 U.S.C. 301 et seq.; 21 C.F.R. 1.1 et seq.

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# Shellfish Poisoning Episode In False Pass, Alaska

By H. F. MEYERS, B.S.,  
and D. K. HILLIARD, M.S.

A FATAL CASE of shellfish poisoning attributed to eating mussels that had fed on the dinoflagellate plankton, *Gonyaulax catenella*, was reported July 21, 1954, by the United States Commissioner at Dutch Harbor, Alaska. Since a survey of shellfish toxicity was being conducted in northern Alaskan waters at the time by the Public Health Service Arctic Health Research Center in Anchorage, the case was investigated thoroughly.

The poisoning occurred at a salmon cannery in False Pass on the northeastern end of Unimak Island in the Aleutian Chain. The following is an excerpt from the log of Dr. J. Clark, Alderwood Manor, Wash., physician at the cannery hospital, who gave invaluable assistance and cooperation at False Pass:

"Patient seen by physician at 4:45 p. m. and found suffering severe abdominal pain and nausea with vomiting. Man expired at 5:00 p. m. same date. Time of onset of illness between 2:00 p. m. and 4:45 p. m. All information gathered from fellow workers as man was unable to talk to physician. It is stated he was quite ill before calling for assistance. Symptoms when seen were those of poisoning and believed to have been caused by mussels."

Four days prior to the fatality, six other cannery workers consumed mussels from the same source. They reported to the hospital, however, at the first signs of illness, received gastric lavage and medications, and were released the next day.

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Mr. Meyers, a chemist, and Mr. Hilliard, an aquatic biologist, are with the Public Health Service Arctic Health Research Center at Anchorage, Alaska.

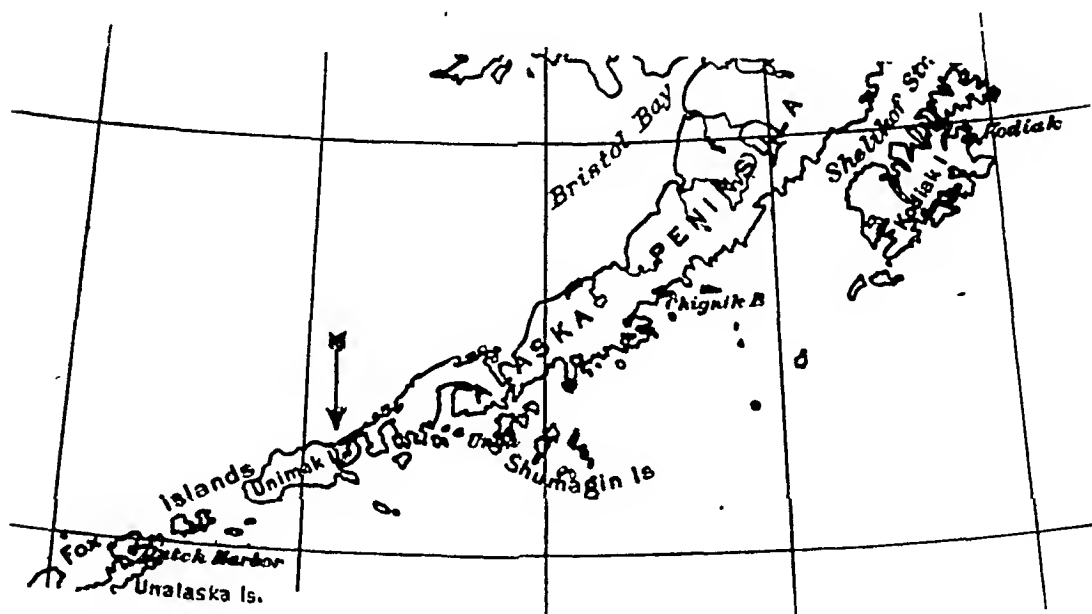
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The beaches at False Pass are primarily rock with some sand and gravel. The shoreline is irregular and has small coves which are undisturbed by the main current. These small coves are rich in various forms of algae and zooplankton, in addition to the usual debris and cannery waste. While the maximum difference between high and low tide is very small (2 feet) the current is extremely swift, changing direction with each change of tide. According to cannery workers, the current usually attains a velocity of from 5 to 7 knots.

Specimens of *Mytilus edulis* Linnaeus, the shellfish eaten by the cannery workers, were collected from several locations along the beach. While great numbers of the mussels were attached in clusters to rocks exposed at low tide, an even greater number were attached to the ocean floor and obviously not exposed during extreme tides. The mussels were extracted at the local cannery hospital, bottled, and retained for bioassay at the Arctic Health Research Center laboratory. Plankton samples were collected simultaneously and preserved in Transeau's solution for laboratory examination.

The extraction and bioassay were carried out according to currently accepted methods, that is, 100 gm. of mussel tissue were ground and mixed with 100 ml. of 0.1N hydrochloric acid. The mixture was refluxed for 5 minutes, rather than boiled in a beaker, so that it was unnecessary to bring the mixture back to the original volume. The pH was adjusted to 4.0-4.5, the mixture centrifuged, and the clear supernatant liquid withdrawn and preserved in sterile bottles. One ml. of this liquid, when injected intraperitoneally into a 19.8 gm. mouse, caused death in 48 seconds. Numerous dilutions were made, and a range of from 74,000 to 106,000 mouse units per 100 gm. of raw material was obtained. A mouse unit is the amount of poison contained in 1 ml., pH 4.0-4.5, that will kill a 20-gm. mouse in 15-20 minutes after intraperitoneal inoculation. It has been estimated by other workers that the minimum lethal dose for man is probably between 20,000 and 40,000 mouse units (1). On the basis of this evidence

False Pass (arrow) latitude 54°52' N., longitude 163°24' W., is the first break in the Alaska Peninsula allowing waters from the Bering Sea to come in contact with the Pacific Ocean.



the Arctic Health Research Center stated, for public information, that less than 4 ounces of raw material would produce lethal results.

Microscopic examination of the plankton samples obtained at False Pass indicated that the organism *Gonyaulax catenella* Whedon and Kofojd was present, but not in large numbers. Since travel in the Aleutian Chain is almost entirely by air and is dependent upon weather and fog conditions, 2 weeks had elapsed between the death reported and collection of samples. It is possible that the ideal conditions for growth of this organism no longer existed. It has been stated (2) that "The strong radiation of the sun together with the cold nutrient waters due to upwellings seem to be ideal for the growth of this dinoflagellate." The nutrition supplied by the cannery waste together with the cold waters of the Bering Sea coming in contact with the warm

waters of the Pacific in this small pass would more than fulfill these ideal conditions.

Future work is planned in connection with shellfish poisoning in the Aleutian Chain, particularly in the Kodiak area. Natives at False Pass, Kodiak, and at other points on the Aleutian Chain refer to individuals who in the past have become violently ill, with an occasional death, after eating shellfish. Since there was seldom a physician available, the stories could not be substantiated.

#### REFERENCES

- (1) Meyer, K. F.: Medical progress: Food poisoning. *New England J. Med.* 249: 843, Nov. 19, 1953.
- (2) Somner, H., and Meyer, K. F.: *Mussel poisoning: Manual for the control of communicable diseases in California.* San Francisco, California State Department of Public Health, 1948.

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# The American Social Hygiene Association

By C. WALTER CLARKE, M.D.

TODAY, 40 years after the American Federation for Sex Hygiene and the American Vigilance Association merged to form the American Social Hygiene Association, the country recognizes that, although much has been accomplished in sex education, venereal disease control, and the suppression of prostitution, the problems the American Social Hygiene Association faced up to originally remain a challenge. Nor is it so remarkable that present social hygiene problems are in many ways identical to those of 1914. Problems rooted in human nature require generations of cooperative planning, research, demonstration, and field work for their solution. They do not lend themselves to the once-over-lightly treatment optimists would give. Instead, as one or another aspect of these problems has changed according to time or circumstances, emphases have changed to meet the need.

## Mobilizing Public Opinion

Dr. Charles W. Eliot, John D. Rockefeller, Jr., James Bronson Reynolds, Dr. William F. Snow, and others present at the first meeting

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*Dr. Clarke, executive director emeritus of the American Social Hygiene Association, has been a member of the association's staff since 1914 as field secretary, European representative, medical director, and executive director. He has served as clinical professor of public health practice, Harvard University, and has been associated with a number of State, national, and international health and welfare organizations. During World War II, Dr. Clarke was consultant to the Secretary of War.*

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of the new national association in 1914 did not minimize the difficulties before them. They knew there was as yet no public opinion to support their aims and that the channels through which public opinion can usually be molded were firmly closed to them. Public discussion of sex problems was taboo. On the credit side, however, they had the support of distinguished leaders who could eventually influence public opinion. Men and women like David Starr Jordan, Jane Addams, Grace Dodge, Cardinal Gibbons, Felix Warburg, and Julius Rosenwald had been attracted to the social hygiene movement by the work of the association's two parent organizations and especially by the work of Dr. Prince A. Morrow, president and founder of the American Federation for Sex Hygiene. Perhaps less effective was the support of the 12 "sex hygiene societies" and about an equal number of "vice commissions" in cities from coast to coast. Their feeble, fumbling attacks on the great problems of sex ignorance, sexual vice, and venereal disease did little to break down ignorance and complacency.

As it was, only a few individuals had the courage to participate in this unpopular movement. The earliest leaders were preponderantly physicians, whose professional training permitted them to discuss social hygiene without censure, and a few clergymen, businessmen, and educators. The new association set out to increase the number of such leaders, people who could influence public opinion and open channels to the public. Once the conspiracy of silence in the press, pulpit, classroom, and home was overcome, the American Social Hygiene Association could make progress in its efforts to help correct abominable conditions.

Although World War I was responsible for

lence, made censuses of venereal disease cases under private and clinic treatment, evaluated the venereal disease control programs of cities and counties and suggested improvements, drafted and successfully urged the adoption of the first prenatal examination law and an improved premarital examination law, and published digests of laws dealing with the venereal diseases, prostitution, and related offenses. Through the League of Nations, League of Red Cross Societies, and International Union Against the Venereal Diseases, the association aided international health and social welfare programs, especially those aimed at suppressing traffic for immoral purposes in women and children. From 1935 to 1938 an officer of the ASHA organized a venereal disease control program for New York City, one of the most complete at that time.

A joint committee of the American Pharmaceutical Association and the ASHA, formed in 1939, has stimulated cooperation between the two groups in informing the public about the dangers of quacks and nostrums and in stressing the fact that only members of the medical profession can give adequate treatment for venereal diseases.

In 1920 ASHA began to build public opinion toward a new national effort. This was a long process. Not until 1937 was the time ripe to ask Congress for new Federal legislation based on recommendations of the Conference of State and Provincial Health Authorities, American Social Hygiene Association, and other agencies, after careful studies by the Public Health Service and State health authorities. The LaFollette-Bulwinkle bill, passed in 1938 without opposition, authorized the appropriation of \$3 million to start venereal disease control operations. As the program developed, appropriations were increased. With the Federal Government at the helm of the control program, it was not long before State and Territorial health departments were using new and highly effective control techniques in an integrated attack against venereal disease. The importance of Federal leadership was proved at this time. By the time the United States entered World War II, medical and health authorities were reasonably well provided with facilities

and personnel to cope with an anticipated rise in incidence of syphilis and gonorrhea resulting from disturbed social conditions during and following the war.

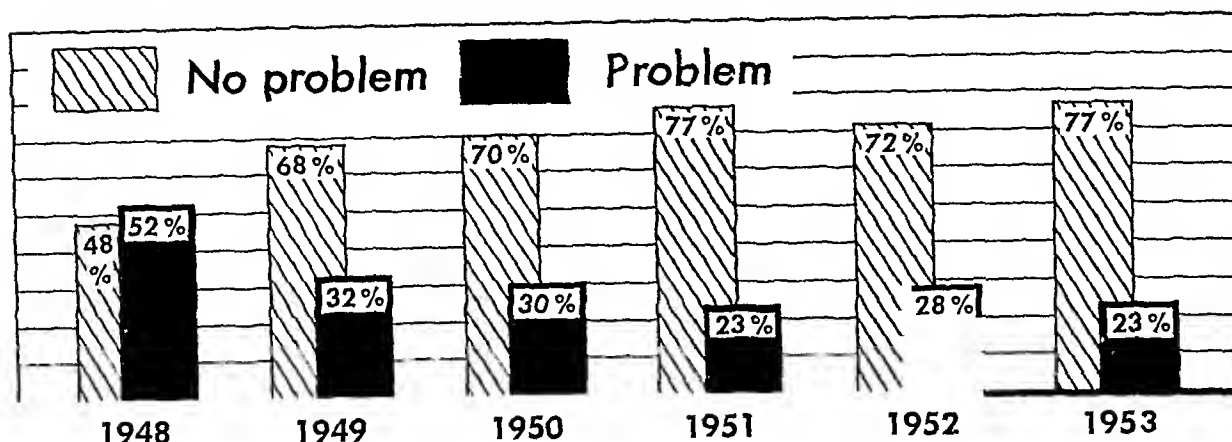
## World War II

In September 1939, when President Roosevelt declared a "limited emergency" the American Social Hygiene Association immediately turned all its resources to activities in support of the defense effort. In 1940 the War and Navy Departments pledged in an 8-point agreement to control venereal disease near concentrations of the armed forces or defense workers, and they agreed to cooperate with police authorities in repressing prostitution. The American Social Hygiene Association and State and local social hygiene groups set out to stimulate public support.

After mobilization began, on the basis of the association's suggested legislation, Congress passed the May Act, which gave the Army and Navy authority to cope with prostitution conditions near training centers. At the association's suggestion, the Federal Security Agency created the Social Protection Division to cooperate with State and local officials in maintaining a wholesome environment near training centers, and the Federal Security Administrator established an Interdepartmental Venereal Disease Committee to facilitate cooperation between the Federal Security Agency and the Army, Navy, and American Social Hygiene Association.

As a member of a team seeking to protect the armed forces from prostitution and venereal disease, the association provided up-to-date facts about prostitution conditions near military installations; encouraged civilian support of the official health and welfare program for protecting the armed forces and defense workers; participated in training personnel for venereal disease control activities; and helped provide the Army and Navy with educational materials. An officer of the association served as consultant on venereal disease control to the Secretary of War and as a member of the National Research Council's committee supervising experiments in penicillin therapy for syphilis and gonorrhea.

Existence of prostitution in representative cities in the United States and Territories, 1948-53.



As a result of all these official and voluntary activities, the venereal diseases were kept under control to a greater extent than during any other war in our history (3).

Character guidance and education programs in the armed forces, plus widespread cooperation among government, military, and community agencies, also had a beneficial effect in decreasing prostitution. In 1942 the association's survey of prostitution showed an improvement in conditions. Civilians in communities which had long tolerated prostitution had had to reverse their thinking when the May Act declared prostitution a menace to the health and welfare of service personnel. More and more, people came to regard it as a social evil that weakened all law enforcement, exploited young people, and endangered the health and welfare of all. In its efforts to keep communities wholesome, the association had the support of such agencies as the Federal Bureau of Investigation; American Bar Association, which appointed a Committee on Courts and Social Protection to help control vice; National Police Committee on Social Protection, which developed new techniques of law enforcement in repressing prostitution; National Sheriffs' Association and International Association of Police Chiefs, which adopted resolutions condemning toleration of prostitution; General Federation of Women's Clubs; and Federal Council of Churches.

In 1944 with the establishment of Joint Army-Navy Disciplinary Control Boards (which now encompass all the services), ASHA and other interested civilian groups sent their

representatives to board meetings as advisers requested by the military. ASHA's special contribution was to advise on civilian education and repression of prostitution and to supply the facts on prostitution conditions near military establishments.

#### Postwar Period

In 1946 and 1947 venereal disease rates at first rose to a high point and then began to fall as penicillin became more widely used, as vigorous venereal disease case finding and contact tracing and activities repressing prostitution were instituted, and as social conditions became more stable. After the discontinuance of the Federal Social Protection Division, the association reestablished its Washington liaison office and its field offices across the country. (This expansion was financed by the United Service Organizations and later by the United Defense Fund.) When mobilization began in 1948, the military asked ASHA to pay special attention to communities near military camps in surveying prostitution conditions. The association also responded to requests for millions of pamphlets warning young servicemen about the dangers of venereal disease and other menaces to their health or morale. These services the association is still providing.

Like other interested organizations, the American Social Hygiene Association has considerable appreciation of the great accomplishments in venereal disease control during the last several years. ASHA is encouraged about the prospects of ultimate control of these dis-

Over 7 million women have seen the film in the past 4½ years, four times as many people as have seen any other health film, and, in what seems to be an upswing of interest during the last year and a half, 1½ million women saw it in 1953. The total influence upon these people and upon others with whom they may associate, of course, can never be calculated. In the certainty that Breast Self-Examination can profoundly effect efforts toward the successful control of breast cancer, this educational material will continue to be offered to the women of this and other countries.

#### REFERENCES

- (1) Medical motion pictures. Breast self-examination. *J. A. M. A.* 143: 673 (1950).
- (2) Iowa State Health Department. Division of Cancer Control: Can a movie establish a new health habit? A report on presenting the film breast self-examination to women in Iowa. Des Moines, Iowa, 1954.
- (3) Cohart, E. M., and Hill, J. K.: Evaluation of the breast self-examination film. *Am. J. Pub. Health* 42: 430-436 (1952).
- (4) Lewison, E. F., Jones, H. W., Jr., Doran, W. T., Jr., and Mandel, B. J.: Breast self-examination: Educational and clinical effectiveness of the film. *Maryland State M. J.* 3: 1-3, 130 (1954).

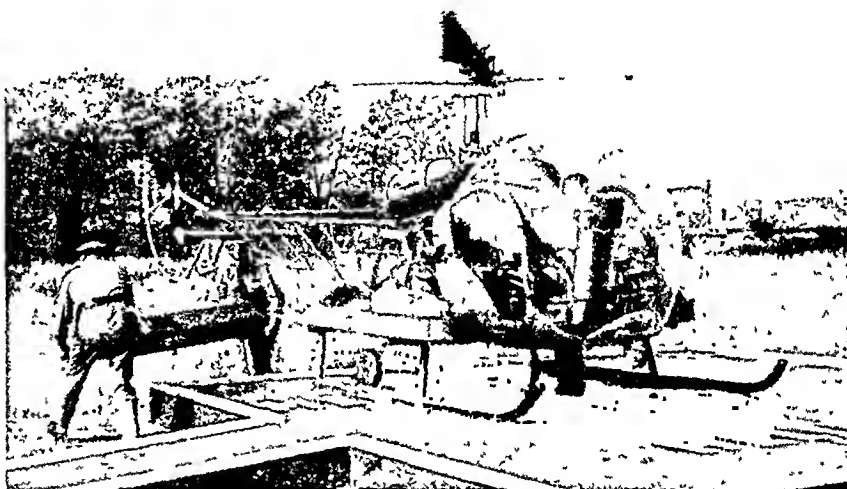
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### *Helicopter Ambulance Service*

**BUFFALO, N. Y.** Kenmore Mercy Hospital in Kenmore, N. Y., a suburb of Buffalo, is one of the two hospitals in the United States that now has helicopter emergency ambulance service. A temporary heliport, a 20-foot square wooden platform, has been constructed a few feet from the emergency entrance to the hospital, and a helicopter is on call any time of the day or night.

The service was instituted last fall with an offer by the Bell Aircraft Corporation to make available one of its helicopters for use in rushing critically sick or injured patients to the hospital. Physicians in this highly industrialized area of approximately a million people estimate that the helicopter will be used for at least 8 to 10 patients annually—perhaps a stricken sailor aboard a lake freighter miles from port, or an expectant mother in a remote, snowbound farmhouse, or a wounded hunter along a wooded trail.

A call to the hospital or the corporation for the service is immediately referred to the company physician, who dispatches the helicopter if conditions warrant its use. All the company's medical personnel



**A trial run with an "accident victim" officially opened the new heliport at Kenmore Mercy Hospital. Note that even before the helicopter's rotor blade stopped turning, the top was lifted from the helicopter litter.**

and guards have been given instruction on the handling of litters.

Used extensively during the Korean conflict to evacuate injured fighting men and civilians, the helicopter has proved its usefulness in removing injured persons from areas inaccessible to other forms of vehicular transportation. During floods in Holland, avalanches in the Alps, and earthquakes in the Ionian Islands off the coast of Greece, rotorcraft performed formidable rescue feats.

Helicopter ambulance service was first established in the United States

at a hospital in Santa Monica, Calif. Here a rooftop platform serves as a landing area, and helicopters are made available by rotorcraft firms in the Los Angeles area. Arrangements are now being made for the construction of a heliport in the Dallas-Fort Worth area.

It is not practical from an expense standpoint for a hospital to maintain and operate a helicopter. It might be practical, however, for local governments to own rotorcraft since they could be used to augment the services of a number of municipal agencies.



# State Air Pollution Control Activities

By RICHARD L. WOODWARD, Ph.D.

AIR POLLUTION CONTROL in the United States has traditionally been a function of municipal governments. Virtually all of our larger cities have some type of ordinance for controlling air pollution. In the past, most of these laws were directed primarily at controlling coal smoke, but in recent years many of the laws have been broadened to consider other air pollutants as well. Most of the recently adopted air pollution control ordinances contain provisions on gas, vapor, fumes, and dusts from sources other than coal combustion.

With the growth of metropolitan areas and the movement of industries to suburban sites, it has become apparent that a municipality frequently is an unsuitable unit for operating an effective air pollution control program. If city A is carrying on a vigorous program of air pollution control, while neighboring city B does little or nothing, not only does the pollution from B affect A when the wind is in the right direction, but the residents and industries in city A will resist enforcement of their own

laws. To overcome this difficulty, government units which control larger areas have been utilized. The first of these was in the Boston metropolitan area. The area, including some 31 cities and towns, has had a smoke control program since 1910 under the supervision of the division of smoke inspection, Massachusetts Department of Public Utilities.

In other areas the county was chosen as a suitable administrative unit. Hudson County, N. J., adopted a smoke control ordinance in 1931. In 1947 California passed an air pollution control ordinance establishing districts in each county. The district boundaries are coextensive with county boundaries and can be activated by the county boards of supervisors. Districts are operating under this act in Los Angeles County and in Santa Clara County. Kentucky adopted a similar law in 1952, and in the same year the Louisville-Jefferson County district was established to supersede the Louisville organization which had been powerless to act against important sources of pollution outside the city limits. Milwaukee County, Wis., and Allegheny County, Pa., also have countywide air pollution laws.

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*Dr. Woodward is sanitary engineer in charge of the Water Treatment Unit at the Robert A. Taft Sanitary Engineering Center, Public Health Service. During 1953-54 he was with the center's Planning and Evaluation Unit and worked on the development of the air pollution research program. This paper was presented at the annual meeting of the American Society of Civil Engineers in New York City, October 1954.*

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## Need for State Action

In a number of instances the county is not an ideal unit for air pollution control work. In the San Francisco Bay area, for example, nine counties are involved. Many other metropolitan areas include parts of more than one county.

Moreover, although air pollution problems



are generally associated with large cities, they are not limited to them. Damage to crops, to other vegetation, and to cattle by fumes from smelters and other industrial installations have been the cause of considerable litigation. Many industrial installations are located in rural areas where there is no effective agency for air pollution control, and virtually the only remedy available to persons affected has been through direct court action.

Many parallels, legal and other, exist between the problems of air pollution and water pollution. Both are basically economic problems and both require a considerable amount of technical knowledge and skill for their solution. Both air and water pollution are to some extent inevitable and determinations must be made of what degree of pollution is to be tolerated and how pollution is to be abated or prevented. Both are continuing problems which require continuous positive action on the part of waste producers if pollution is to be kept within acceptable limits.

Air pollution and water pollution have important differences as well as similarities, and in some respects the air pollution problem is far more complicated. However, it is apparent that direct court action by the damaged parties is not an effective method of attacking either problem. In view of the position of the States under our form of government, the State is the logical unit for adoption of laws, development of programs, and assistance to local governmental units in the actual abatement of pollution.

One of the major fields in which there is need for State action is the provision of specialized technical services. A compilation of the expenditures of local air pollution control agencies made by the Air Pollution Control Association in 1952 showed that only 17 cities had budgets of \$25,000 per year or more (1). Only nine cities spent more than 15 cents per capita per year, the maximum being 35 cents per capita. In most communities, at least half of the personnel are inspectors. Thus, only the large cities are able, with present appropriations, to support more than the most rudimentary laboratory facilities for sampling and analyzing air to provide the basic information

needed to assess problems or to support the technical staff needed to prescribe solutions to other than routine problems. The smallest city spending as much as \$25,000 per year in 1952 was Syracuse, N. Y., with a population of 220,000. Even so small a city will probably need considerable outside technical assistance in dealing with certain problems.

### Survey of State Activities

The communities naturally look to State agencies for technical assistance and in most States some attempt is made to fill this need. A survey recently completed by the Robert A. Taft Sanitary Engineering Center indicates that in all but seven States some attempt is made to assist local governments in solving air pollution problems. As a rule the State agency most active in this field is the health department. In a few States, such as New York, the labor department is active, and in others State-supported universities provide technical assistance to communities and industries.

In most States, however, these activities are only incidental to other work, and no specific financial support is provided for air pollution consultation, technical assistance, or control activities. In six States an agency has either an effective legislative mandate with respect to air pollution, specific executive authorization, or funds earmarked for this purpose. From this, it is obvious that in a majority of the States the activities of the agency are severely limited by lack of funds.

All of the State laws regarding air pollution other than the ordinary nuisance laws are relatively new and reflect the increasing interest and concern which have been particularly marked since the end of World War II. This same increase in interest is shown by the fact that about 80 percent of the local ordinances in effect in our larger cities have been adopted or revised in this same period.

Three States, Oregon, Massachusetts, and New Jersey, have laws establishing air pollution control agencies in the State government. In Oregon and New Jersey, an air pollution control commission or authority is established within the State health department. In Massa-

chusetts the law places authority and responsibility in the health department without specifying the internal organizational unit for the activity. The division of sanitary engineering will, however, be responsible for air pollution control work under this law. The division of smoke inspection, formerly under the department of public utilities, was transferred to the health department and is continuing its work in the metropolitan Boston area.

Oregon's law, the first of the three, was passed in 1951. The Massachusetts and New Jersey laws were adopted in June and September 1954, respectively. All three of the laws give the State agency power to promulgate rules and regulations aimed at preventing or controlling air pollution and outline procedures for dealing with violations. Although in each case the State health department administers the law, the agency is not limited to considerations of the effects of air pollution on health.

The Massachusetts and New Jersey laws deal with the relationships between the State agency and local governmental air pollution control organizations in some detail. The Oregon law gives the authority to advise, consult, and cooperate with such groups and to encourage activity against air pollution. In Massachusetts, local agencies are authorized to regulate air pollution within their respective areas, with their rules and regulations being subject to approval by the State health department. If air pollution from one community adversely affects another, the State health department is authorized, upon request of the affected community and after a hearing with the parties concerned, to assume joint jurisdiction in dealing with the problem.

The New Jersey law authorizes the State Air Pollution Control Commission to organize county air pollution control commissions with advisory functions and also provides that the law shall not supersede local ordinances and regulations nor preclude the right of local agencies to adopt ordinances and regulations which are not inconsistent with the State law.

The Massachusetts and New Jersey laws have been passed so recently that there has been no experience with their operation. The Oregon Air Pollution Authority currently

operates on a biennial budget of \$85,000 with a staff of 4 engineers, 1 chemist, and 1 stenographer and is authorized to develop a comprehensive program for air pollution control throughout the State. The staff has engaged in broad studies of the air pollution problems of the State as well as in investigations of specific problems brought to its attention by complaints. Experience to date has indicated a need for extension of the State air sampling activities and for the adoption of local ordinances to cope with air pollution problems within cities.

Maryland and Pennsylvania maintain units within the industrial hygiene bureaus of their health departments with specific responsibilities for investigation, consultation, and assistance to local agencies on air pollution problems. The Maryland unit, although only partially staffed, has provided assistance to a number of communities. The Pennsylvania unit is well equipped with two mobile laboratories for conducting studies and has investigated a number of air pollution problems throughout the State.

In Washington a different scheme has been adopted. The environmental research laboratory of the University of Washington was established in 1951 and has conducted a number of studies of air pollution problems on a fee basis for both public agencies and private sponsors. The Washington Institute of Technology has conducted research on the effects of air pollution on animal life and vegetation. On March 15, 1954, funds were made available by the Governor, and a statewide air pollution advisory service, which can provide assistance to local governments without requiring direct financial support from them, was established. This service is organized with the director of the Washington Pollution Control Commission as the State official cognizant of all air pollution activities, the environmental research laboratory as technical consultants on community health and welfare aspects of air pollution, the Washington Institute of Technology as technical consultants on the agricultural aspects of air pollution, and the air pollution committee of the Washington State Health Council as a general policymaking group.

In addition to these State activities, a number of States have considered legislation on air pollution, and several have established legislative committees or commissions to consider the need for legislation on the subject during the past 5 years. At least 16 States are known to have had some air pollution legislation or resolution under consideration in recent years.

One interstate air pollution problem has been the subject of State legislation. The New York legislature during its 1954 session passed a bill appropriating \$30,000 for use by the Interstate Sanitation Commission in studying the air pollution problem in the New York metropolitan area and developing recommendations for coping with this interstate problem. The act is to take effect when New Jersey makes a similar appropriation. The companion legislation in New Jersey has not been passed. Similar legislation was passed in 1952 by New York but not by New Jersey.

#### Summary

Since the end of World War II there has been a marked increase in interest in air pollution and in activities aimed at its control. Although the problem has been traditionally considered one for local action, in many places the need

for State assistance to local governments has become apparent. State assistance is also needed to deal with problems when local control agencies are nonexistent or powerless to act because of lack of jurisdiction.

Three States, Oregon, Massachusetts, and New Jersey, have recently established air pollution control agencies in their State health departments with power to control air pollution. Three other States, Maryland, Pennsylvania, and Washington, have provided funds specifically for investigations of air pollution problems and assistance to local agencies.

In most of the other States, some agency, generally the health department, provides assistance to local agencies incidental to other operations, but such assistance is severely limited by the lack of any specific financial support for the work. In a number of these States, legislation dealing with air pollution has been considered recently. There is a trend toward increasing activity by State agencies in the air pollution field.

#### REFERENCE

- (1) Air Pollution Control Association: Statistical tabulation of air pollution control bureaus, United States and Canada. Pittsburgh, Pa., The Association, 1952.

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## Mental Health Panel Discussion Kit

Portions of the film, *Preface to Life*, have been selected for a mental health panel discussion kit, for use on television or at meetings. The kit includes 135 feet of 16 mm. sound film, on a 400-foot reel in a 400-foot can, and 6 copies of an outline of topics, for use as a guide in presenting a half-hour panel discussion.

Single copies of the outline are available at no charge from the National Institute of Mental Health, Public Health Service, Bethesda 14, Md.

# Ownership and Size of Nursing Homes

By JERRY SOLON, M.A., and ANNA MAE BANEY, B.A.

THE HISTORY of nursing homes in this country has led to a particular pattern in their ownership and size. Most nursing homes are proprietary. Linked to this type of ownership is the typically small bed capacity of these establishments. It is our purpose here to see just what is the size of existing nursing homes, how many of these homes are operated commercially, or how many are under voluntary and public auspices, and how these two features of ownership and size are interrelated.

We will be primarily concerned with the 7,000 establishments described in the parent report of this study as "skilled nursing homes" (1). The national inventory of nursing homes and related facilities on which this study is based set these skilled nursing homes in perspective within a broad family of facilities. Along with skilled nursing homes, the inventory included "personal care homes," some offering skilled nursing and some not, as well as "sheltered homes." As in the earlier report, these related

types of facilities will be drawn in for comparative data.

So rapidly has the nursing home developed during the past 20 years that its history seems more like an eruption than an evolutionary development. Its rapid growth was influenced by the convergence of a number of social and economic circumstances. The principal ones can only be mentioned here in passing. They include the extension of the life span and marked increase of the aged population, changes in family structure and in living arrangements which have tended toward shelving of the older people, and the growing prominence of the chronic diseases, among both young and old. Although the social and biological factors are the basic elements which combined to create a need, their effect was precipitated by additional important elements. Perhaps the most important among these was the disrepute into which the public almshouse had fallen and the emergence of a new philosophy in public welfare in the Social Security Act of 1935. When society turned from almshouses and chose to place cash assistance in the hands of the needy aged, the resulting expanded demand for private living quarters for older people, many of them infirm or ailing, stimulated a significant response.

The easiest and quickest response came from sources requiring the least immediate outlay in capital and organization. Expediency led to widespread use of existing family structures, not otherwise fully occupied, with the homeowner or lessee often having an applicable skill such as nursing and an interest in such an ac-

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*Mr. Solon and Miss Baney, health program analysts in the Division of Hospital Facilities, Public Health Service, present their second report on the national inventory of nursing homes and related facilities. The first report, which appeared in the December 1954 issue of Public Health Reports, p. 1121, introduced overall national estimates and an analysis of the distribution of facilities among States and Territories.*

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tivity as a source of income. Here then was an opportunity for small proprietary ventures.

Some actually started as nursing homes. Some started as boarding homes for elderly people. But in historical background, even as in contemporary operation, the line between homes which offered nursing care and those which provided domiciliary services was not sharply drawn. With the passage of time, homes which had begun as room-and-board enterprises gradually, sometimes imperceptibly, assumed responsibility for meeting personal care and nursing needs as these arose among their aging residents. Thus, many of today's nursing homes are yesterday's small private boarding homes for older people. The current nursing home situation with respect to ownership and size reveals the imprint of these origins.

### Ownership of Skilled Nursing Homes

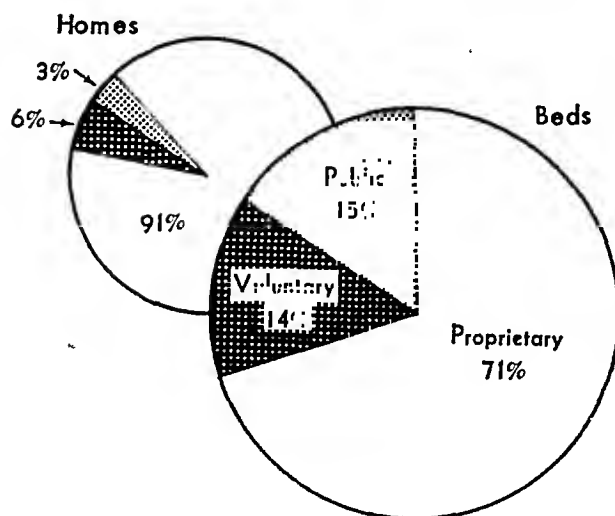
Nursing home is often understood in common parlance to mean private nursing home. This association almost justifies itself, for fully 91 percent of all skilled nursing homes are operated under private commercial ownership.

As though to reinforce this popular identification, the nonprofit voluntary and public institutions have historically been known by other names. Although a nursing home by any name is no less a nursing home, it is often not thought of as such when it bears the label "home for the aged" or "chronic disease hospital" or "county home."

In the present study, institutions are classified by their function regardless of type of name. The resulting facts about skilled nursing homes show that 6 percent are under voluntary (private nonprofit) auspices, of which one-third are church related. Public (State and local governmental) auspices account for 3 percent of the homes.

The picture is somewhat deceptive with these figures alone. The number of beds provided in each category of ownership has an additional significance. Because the voluntary and public homes are typically larger than the proprietary homes, they account for more beds than their small number would suggest (fig. 1). Although

Figure 1. Distribution of skilled nursing homes and beds by type of ownership, 1954.



representing together only 1 home in every 10, they provide 3 beds out of every 10. Thus, the predominance of proprietary ownership, 91 percent in terms of number of homes, is abbreviated to 71 percent in terms of number of beds.

The preponderance of proprietary skilled nursing homes is observed over and over again in the individual States (table 1). It is true that in a number of States there are relatively few proprietary skilled nursing homes or even none at all. However, these are generally States with few establishments all told. It should be mentioned here, however, that since detailed field surveys were not requested of the States for the purpose of the present inventory, the data reported for some individual States may not be wholly reliable.

### Ownership of Related Facilities

Proprietary ownership is relatively less prominent in personal care homes and sheltered homes. In those categories, the voluntary and public auspices are traditionally more active than they are in skilled nursing homes (table 2).

#### *Care Homes With Skilled Nursing*

Among the several types of facilities related to skilled nursing homes, it is only in personal care homes with skilled nursing that voluntary sponsorship exceeds the proprietary in number of beds provided. Both secular and church groups have developed their programs quite

Table 1. Distribution of skilled nursing homes and beds, by type of ownership, by State and Territory, 1954

State	Number of homes				Beds			
	Total	Type of ownership			Total number	Percent distribution by type of ownership		
		Proprietary	Voluntary	Public		Proprietary	Voluntary	Public
Total, 51 States and Territories reported <sup>1</sup>	2 6, 539	5, 953	387	198	3 171, 816	70. 7	13. 8	15. 5
Alabama	67	59	4 8	—	1, 446	—	—	—
Arizona	7	7	0	0	132	100. 0	0	0
Arkansas	61	54	5	2	1, 281	71. 3	8. 6	20. 1
California	573	530	23	20	12, 806	74. 3	7. 6	18. 2
Colorado	52	47	4	1	1, 775	89. 5	5. 5	5. 1
Connecticut	193	186	6	1	4, 868	91. 8	6. 8	1. 4
Delaware	1	0	1	0	44	0	100. 0	0
District of Columbia	7	4	3	0	311	15. 8	84. 2	0
Florida	43	42	1	0	3 475	—	—	—
Georgia	56	47	8	1	1, 822	63. 9	35. 0	1. 1
Idaho	1	0	1	0	36	0	100. 0	0
Illinois	527	481	14	32	3 16, 753	61. 0	8. 3	30. 8
Indiana	175	175	0	0	3, 035	100. 0	0	0
Iowa	278	247	30	1	6, 303	69. 8	29. 9	3
Kansas	5	4	1	—	118	—	—	—
Louisiana	53	47	6	0	1, 631	79. 7	20. 3	0
Maine	189	187	2	0	2, 491	89. 0	11. 0	0
Maryland	112	103	8	1	3, 604	79. 0	7. 9	13. 0
Massachusetts	484	468	14	2	10, 854	91. 7	6. 6	1. 7
Michigan	458	394	29	35	14, 256	51. 1	13. 8	35. 1
Minnesota	178	152	17	9	4, 242	65. 5	26. 8	7. 7
Mississippi	2	0	0	2	3 24	0	0	100. 0
Missouri	95	77	18	0	3, 832	55. 7	44. 3	0
Montana	8	7	0	1	289	83. 7	0	16. 3
Nebraska	3	0	3	0	440	0	100. 0	0
Nevada	10	2	0	8	239	23. 0	0	77. 0
New Hampshire	75	69	3	3	1, 681	72. 0	5. 6	22. 4
New Jersey	147	118	17	12	5, 220	56. 8	14. 3	28. 9
New Mexico	36	34	0	2	547	63. 3	0	36. 7
New York	767	739	17	11	20, 717	80. 4	3. 8	15. 9
North Carolina	4	2	2	0	59	62. 7	37. 3	0
North Dakota	7	5	2	0	143	63. 6	36. 4	0
Ohio <sup>5</sup>	471	418	53	0	12, 838	66. 9	33. 1	0
Oklahoma	109	102	6	1	1, 927	86. 8	11. 1	2. 1
Oregon <sup>2</sup>	171	159	6	5	3, 914	81. 3	4. 3	13. 7
Pennsylvania	146	115	0	31	7, 448	36. 2	0	63. 8
Rhode Island	40	39	1	0	642	98. 1	1. 9	0
South Carolina	29	26	2	1	618	71. 8	21. 0	7. 1
South Dakota	2	2	0	0	18	100. 0	0	0
Tennessee	29	26	3	0	700	80. 3	19. 7	0
Texas <sup>5</sup>	120	114	6	0	2, 683	90. 1	9. 9	0
Utah	3	1	2	0	73	13. 7	86. 3	0
Vermont	82	78	4	0	841	90. 0	10. 0	0
Virginia	144	134	7	3	3, 129	72. 8	9. 4	17. 8
Washington	298	264	26	8	8, 964	77. 0	19. 1	3. 9
West Virginia	51	43	6	2	1, 697	66. 4	8. 7	24. 9
Wisconsin	152	133	18	1	4, 267	61. 6	37. 5	9. 9
Wyoming	13	11	1	1	151	68. 2	18. 5	13. 2
Alaska	0	0	0	0	0	0	0	0
Hawaii	3	1	1	1	366	5	11. 7	87. 7
Puerto Rico	2	0	2	0	66	0	100. 0	0

<sup>1</sup> Virgin Islands did not report. Kentucky's total of 149 homes with 2,604 beds could not be classified by type of facility, for lack of information on level of service. <sup>2</sup> Includes one home (22 beds) of unknown ownership. <sup>3</sup> Incomplete figure. Number of beds not reported for some homes (21 homes in Florida, 28

homes in Illinois, 1 home in Mississippi, and proportionately negligible numbers in 5 other States). <sup>4</sup> Probably incomplete. <sup>5</sup> May be under-reported since a considerable number of homes were not identified as to type of facility.

NOTE: A dash (—) represents "not known."

With 91 percent of all skilled nursing homes under proprietary operation, the popular conception of the nursing home as a small private establishment is objectively accurate. This conception, however, should not cloud the significant, though smaller, role of voluntary and public auspices in this type of facility. Although these nonprofit interests represent only

1 home in 10, they provide, as a result of their usually larger size, 3 beds of every 10.

#### REFERENCE

- (1) Solon, J., and Baney, A. M.: Inventory of nursing homes and related facilities. Pub. Health Rep. 69: 1121-1132, December 1954.

## Definition of Sanitary Engineer Revised

A revision of the 1943 definition of the term, "sanitary engineer," was approved by the Committee on Sanitary Engineering and Environment of the National Research Council, December 14, 1954. The new definition follows.

The professional occupational title "sanitary engineer" shall apply to a graduate of a full 4-year, or longer, course leading to a bachelor's, or higher, degree, with the qualifications noted below, at an educational institution of recognized standing, as defined below, with major study in engineering, who has fitted himself by suitable specialized training, study, and experience (a) to conceive, design, appraise, direct, and manage engineering works and projects developed, as a whole or in part, for the protection and promotion of the public health, particularly as it relates to the improvement of man's environment, and (b) to investigate and correct engineering works and other projects that are capable of injury to the public health by being or becoming faulty in conception, design, direction, or management.

Persons lacking in formal education who otherwise meet the terms of the above definition may be considered as having the equivalent of a full 4-year course in engineering

in an educational institution of recognized standing provided they are registered engineers and have sufficient experience or training of the type defined above to substitute for the engineering education lacking. The basis of such substitution shall be 2 years of appropriate training or experience for 1 year of formal engineering education.

An educational institution of recognized standing is defined as one which is accredited by a national or regional accrediting association, such as the Association of American Universities, or the New England, Middle States, North Central, Southern, or Northwest Association of Secondary and Higher Schools, or one whose professional curriculum has been accredited by the Engineers' Council for Professional Development of the Committee on Professional Education, American Public Health Association.

The practice of sanitary engineering includes the following activities:

1. Surveys, reports, designs, reviews, direction, management, operation, and investigation of works or programs for:

(a) Water supply, treatment, and distribution.

(b) The collection, treatment, and disposal of community wastes,

viz., sanitary sewage, industrial wastes, and refuse, including salvage and reclamation of useful components of such wastes.

(c) The control of pollution of surface waterways and ground waters, and of surface and subsurface soils.

(d) Milk and food sanitation.

(e) Housing and institutional sanitation.

(f) Insect and vermin control or eradication.

(g) Rural, camp, and recreation place sanitation.

(h) The control of atmospheric pollution and air quality, and of light, noise, vibration, and toxic materials, including application to work spaces in industrial establishments (including hygiene engineering).

(i) The prevention of radiation exposure.

(j) Other fields that have as their major objective the control of environmental factors affecting health.

2. Professional research and development work supporting the activities listed in 1.

3. Responsible teaching of sanitary engineering subjects in educational institutions of recognized standing.



# Rocky Mountain Spotted Fever Incidence

Until 1931 more than 99 percent of all cases of Rocky Mountain spotted fever reported in the United States occurred in the Mountain and Pacific States where the disease had been known as early as 1873. Prior to 1931 only a few scattered cases had been reported in the North Central States. An investigation of endemic typhus fever in eastern United States, begun in 1930, established the existence of Rocky Mountain spotted fever in the southeastern part of the country. Cases were reported for the first time in the South Atlantic and East South Central States in 1931.

The proportion of reported cases by geographic areas in each 5-year period, beginning with 1930-34 and ending with 1950-54, is shown in the accompanying chart. During this 25-year period, there was a marked reduction in percentage of cases occurring in the Mountain and Pacific States and an increasing proportion in other parts of the country, particularly in the South Atlantic States.

Attack rates per 100,000 population for the various areas by 5-year periods indicate that the peak in incidence of reported cases was reached in the Mountain and Pacific States in the 1930-34 period. Since then, the rate has declined about 80

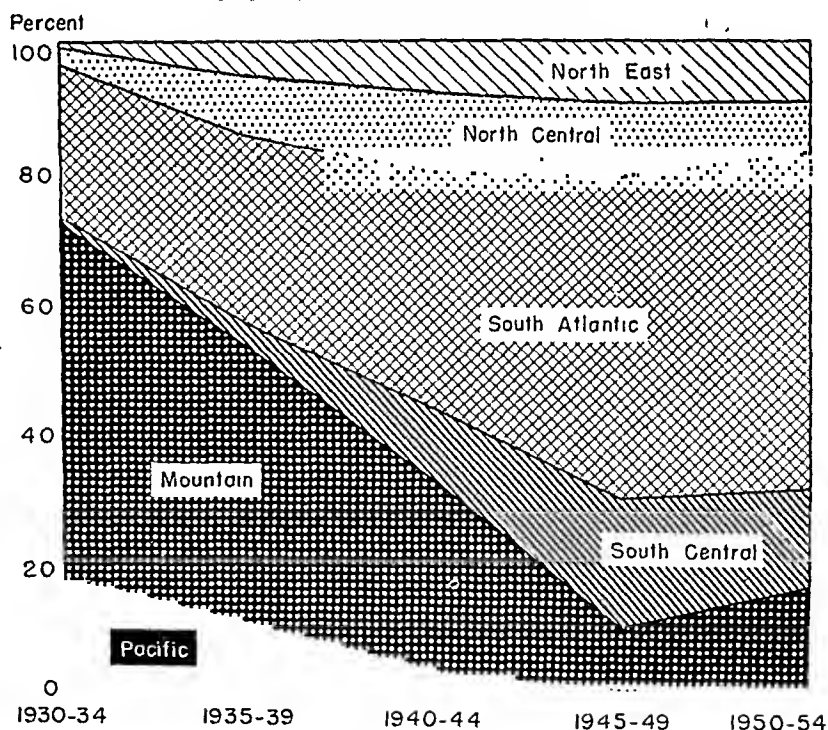
percent. To what extent vaccination, commenced in 1925 on an experimental basis, has been effective in reducing incidence in these areas is not known.

Since 1930 the disease has been reported in all but two States, Maine and Vermont. Only a few scattered cases have been reported in the remaining New England States. In the western part of the country, incidence rates, based on reported cases, have been highest in Wyoming, Montana, Idaho, and Oregon,

in the order named. In eastern United States, Maryland, Virginia, and North Carolina have experienced the highest rates. However, rates in these States have been lower than in the western States noted above.

Prior to the advent of antibiotic treatment of Rocky Mountain spotted fever, the fatality rate for the country as a whole averaged about 18 percent. With extensive use of these therapeutic agents, which began in about 1949, the fatality rate dropped to about 6 or 7 percent.

**Proportion of cases of Rocky Mountain spotted fever reported by geographic areas, 1930-54.**



*Prepared by the National Office of Vital Statistics, Public Health Service.*



# The Yale Study in Public Health Administration

More people enter public health because of chance and as a result of personal contacts with public health workers than for any other reasons. Other important motivating factors are work content and working conditions. Education and training are relatively less important. Formal vocational counseling plays a negligible role in recruitment for public health.

Most public health workers do not enter public health at the beginning of their careers; about one-third have had 10 or more years' experience in other fields before coming to public health. Such experience commonly has been in hospitals and related institutions or in business and industry. Physicians and nurses tend to have had hospital experience, whereas other personnel have worked in business or industry.

There is relatively little movement of public health workers from agency to agency, or even from job to job within the same agency.

The majority of public health workers are college graduates. More than one-quarter have graduate degrees; about one-third of these degrees are in public health. In collegiate and graduate education, emphasis has been on the natural sciences. Ten percent of the workers have had no formal education beyond high school.

The public health worker spends one-third of his time in direct service activities, one-third in administration and community relations and organization, and the remaining one-third of the time in routine, stereotyped activities.

Most public health workers are happy to be in public health. However, one-seventh of the workers are unhappy about public health work in general. The greatest single source of satisfaction for public health workers is not in their jobs but in their associates. Major sources of dissatisfaction are inadequate salaries, excessive clerical work, inadequate work facilities, lack of recognition and appreciation in the agency, lack of opportunity for advancement, lack of responsibility and freedom of action, and the absence of a "sense of belonging" in the agency.

These and many related findings were obtained in a study of public health administration, known as the Yale Public Health Personnel Research Project. The study was initiated in 1950 by a research team of the Department of Public Health at Yale University and was supported by research grants from the National Institutes of Health, Public Health Service, and the National Tuberculosis Association.

Perhaps as important as the findings of the study were the exploration and development of methods by which such studies could be conducted. The project showed some of the things that could be done in administrative research of this nature and, also, some of the things that

could not be done. It differed from past research in that its focus was the public health worker rather than the public health program. Its purpose was to study the backgrounds of public health workers, their activities, and their reactions to their jobs.

The study was motivated by the conviction that the information sought was essential to successful recruitment and efficient utilization of public health personnel. Both are of crucial importance in the face of existing shortages of qualified public health personnel.

The methods employed and some of the findings of this research are being published in a series of papers in *Public Health Reports*.

*a method for studying*

## The Public Health Worker and His Job

By EDWARD M. COHART, M.D., WILLIAM R. WILLARD, M.D.,  
and WILLIAM McC. HISCOCK, M.A.

THE YALE Public Health Personnel Research Project undertook to provide comprehensive knowledge of the professional public health worker and his job. Information on what the public health worker does was the major objective, but information on his training and experience, his working relationships with persons inside and outside his agency, and his personal feelings about his job was also sought. Such information, it was believed, would be useful in obtaining more efficient utilization of personnel and perhaps in recruiting and training workers, in program planning, and in personnel administration.

Job analysis, of course, is not new. The literature contains countless reports of studies of this type in industry and government. But these studies usually have been restricted to stereotyped jobs with routine work patterns. Moreover, the literature failed to reveal any comprehensive approach to the problems of job analysis and utilization of personnel in the pub-

lic health field. The work that had been done had one or more of the following orientations: concern with a specific geographic area, interest in one discipline, study of one or a few agencies, or a focus on either time or salary. Development of a method of study, therefore, was a necessary part of the Yale project.

The initial focus of the project was the health officer. As it became evident that no one job could be studied properly without regard to interrelationships between jobs, however, the scope was enlarged to include other categories of public health personnel. Furthermore, the sphere of interest in each category was broadened as the possibilities for gaining useful information became apparent. The study was concerned primarily with personnel in official agencies, but a small number of voluntary agency personnel participated also.

Originally, it was thought that it would be possible to obtain composite job descriptions at relatively small cost from an analysis of existing job descriptions. The files of public health job descriptions in the States, maintained by the Bureau of State Services of the Public Health Service in connection with grant-in-aid merit system requirements, were studied. This procedure proved unsuccessful because job descriptions rarely describe the actual job.

Therefore, a plan was substituted to study firsthand the job activities of the several categories of workers in selected State and local health departments. It was decided to conduct this investigation by interviews, occasional

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observations, and time studies. The time-study methodology is discussed in a separate article.

## The Code

In order to standardize the interview and to process the information obtained, it was necessary to construct a system of classification. Trial questionnaires were used as a point of departure. On the basis of the information gathered by their use, separate codes were developed for the major service groups in public health. These codes emphasized the differences among the services, which seem to be so important in traditional public health thinking.

After more than a year's experience with these codes, it became evident that it would be impossible to analyze the data except in a very restricted service context. It was necessary, therefore, to identify the characteristics which the codes had in common, with the objective of converting the different schemes of classification into one system which would be applicable to all public health personnel.

A single code, called the universal code, was constructed. A document of approximately 100 pages, this code provides for the classification of thousands of items relating to the activities and experiences of public health workers on the job and to their prior education and training. It makes comparisons possible among the several categories of public health workers.

Provisions were made for coding and classifying in detail the following categories of data: (a) identifying information, (b) education and training, (c) experience, (d) ambitions, objectives, and feelings about the job, (e) technical or direct service activities, (f) ancillary or supporting activities, (g) travel, telephone, and correspondence, (h) activities in administration, including supervision and management, (i) working relationships within the agency and with other agencies, and (j) activities related to public education and community organization.

## The Interview

The basic pattern for interviewing was non-directive. However, while the interviewee was always encouraged to talk freely, a judicious

## Project Personnel

**Co-directors.** Dr. Edward M. Cohart and Dr. William R. Willard.

**Research Assistants.** Irene G. Hiscock, William McC. Hiscock, Erleen F. Jamison, Frances Kord, Virginia R. Marr, Edward Palmer, Vaughn Smith, Laurence R. Wyatt, and Muriel Wyatt.

**General Advisory Committee.** Dr. Stephen Bailey, Dr. Alfred Burgdorf, Ruth Fisher, Dr. Roscoe P. Kandle, Dr. Edmund K. Kline, John MacDougall, Donald Simpson, Clarence I. Sterling, Dr. V. A. Van Volkenburgh, and James Watson. **Consultants:** Dr. Ira V. Hiscock, Dr. Carl E. Buck, Charles B. Frasher, and Dr. C. Winfield Scott.

**Technical Advisory Committees.** **Nursing:** Ruth Fisher, chairman. **Sanitation:** Earl J. Anderson, Dr. Leon A. Bradley, Harold D. Rose, John F. Smith, Clarence I. Sterling. **Health Education:** Dr. Mayhew Derryberry, Ralph T. Fischer, S. S. Lifson, Mary H. Parks, Rae K. Shoemaker, Edward Sierks. **Laboratories:** Dr. Earle K. Borman, Dr. A. L. Harris, Dr. Edmund K. Kline, Dr. Friend Lee Mickle, Dr. C. A. Perry, Dr. E. J. Tiffany. **Statistics:** Carl L. Erhardt, William Haenszel, Elizabeth Parkhurst, Louis Weiner.

question or a brief comment by the interviewer assured inclusion of the desired areas of coverage. Interviewers were required to master the code before undertaking field interviews in order that they might conduct the interview without constant reference to lists of questions. The code was available at the interview, and it was used frequently to demonstrate to the interviewee the type of information desired.

To some extent the technique of the interview was determined by the person being interviewed. Some individuals talk freely and easily; others have to be prompted or directed. The interview tended to be more directive with workers engaged in semiroutine jobs than with those in nonroutine jobs. Even at such interviews, however, questions were open-end in nature and were presented so as not to indicate that a particular answer was being sought.

When a new member joined the research staff of the project, he underwent a supervised training period. This included familiarization with the code and the data to be obtained in interviewing, and review and testing of actual

interview techniques. For the first few weeks, the new member's interview experiences were reviewed by other staff members.

Particularly valuable to the maintenance of uniformity was the assignment of two or more interviewers to the same agency. This procedure made it possible for the interviewers to hold frequent discussions about the problems encountered in interviews, the interpretation and coding of the data, and the use of interview techniques. These team discussions helped to minimize interviewer biases and idiosyncracies. They also resulted in additional suggestions for the analysis of project data.

The conduct of the interview was such that the participants were made to feel that this was "their study," and they were assured that all personal and specific information was confidential and would not reach the ears of their fellow workers or administrative superiors. It was

stressed that the study was not an evaluation, but an inventory. These circumstances, we feel, contributed to greater frankness and veracity in the responses. Furthermore, the interview, by its very nature, permitted of explanation and definition which clarified both questions and responses and enhanced the validity of the resulting data.

About 9 or 10 hours were required for each person interviewed. An average of 3 hours was spent in conducting the interview; approximately 3 hours, in recording and coding the interview information; and the remaining time, in preinterview discussions and conferences, in participation in public relations, in travel, and in project housekeeping functions.

Considerably more than 10 hours per person were required, however, for personnel in voluntary health agencies. The difficulties of making contacts and obtaining clearance for the

**Table 1. Project coverage of public health personnel in official agencies and visiting nurse associations**

State or type of agency	Total number personnel in agencies	Number included in study			Number omitted from study		
		Inter-view	Other means <sup>1</sup>	Total	Change in method	Exclusions <sup>2</sup>	Total
Trial sample:							
Colorado.....	986	86	-----	86	191	709	900
Florida.....	813	219	-----	219	399	195	594
Total.....	1,799	305	-----	305	590	904	1,494
Study sample:							
Connecticut.....	853	285	235	520	-----	333	333
Maryland.....	484	186	105	291	-----	193	193
Michigan.....	848	229	137	366	-----	482	482
New York (one county).....	269	52	74	126	-----	143	143
Total.....	2,454	752	551	1,303	-----	1,151	1,151
Grand total.....	4,253	1,057	551	1,608	590	2,055	2,645
Study sample:							
State health departments.....		378	207	585	-----		
Local health departments.....		326	261	587	-----		
Visiting nurse associations.....		48	83	131	-----		
Total.....		752	551	1,303	-----		

<sup>1</sup> Includes reconstruction from knowledge of agency activities and short interviews, and duplication of data from other persons with like backgrounds, duties, responsibilities, and activities.

<sup>2</sup> Reasons for exclusion: Hospital service, 725; stereotyped or ancillary activities, 721; rare functions (biological production, research), 236; vacant positions, 173; less than one-half time, 93; strictly clinical, 52; trainee positions, 50; new incumbent, 5.

conduct of the study in each voluntary agency, the fact that these agencies were scattered throughout the State, and the small number of workers in any one organization, all contributed to this situation. The research staff found that introductions to State offices from national offices, and to local from State, were not particularly helpful. In each agency, much time was needed to explain the project to the participants and to obtain clearance from various boards and trustees.

### Selection of the Sample

Two proposals for selecting the sample to be studied were advanced: one, that the sample be selected at random from all health departments; and the other, that the sample be selected on the basis of geography, size of the agency, and the urban or rural nature of the population served from only "good," or "better than average," agencies. Discussions concerning the relative merits of the two proposals produced a decision to use the latter. The project thus became a field investigation to inventory the activities and backgrounds of public health workers in selected "better than average" State and local health departments in the United States.

"Better than average" health departments were chosen on the basis of the value judgments of the consultants and advisers to the project. The basic criteria used were the comprehensiveness of the public health program, the adequacy of the public health staff to serve the area and its population, and the quality of staff performance. Selection was made as the result of consideration of many factors, and, therefore, "inferior" as well as "superior" practices were found in the agencies chosen.

The judgment of the State health officer and the director of local health services was relied upon for the selection of local units within each State. These judgments sometimes were augmented by the opinions of a conference committee of local health officers.

### Composition of the Sample

The project obtained information on 1,648 persons actively engaged in public health enter-

**Table 2. Classification of personnel<sup>1</sup> by service and type of agency**

Service	State health departments	Local health departments and visiting nurse associations
Medical.....	47	42
Physicians.....	45	42
Others.....	2	—
Dental.....	8	8
Dentists.....	6	4
Dental hygienist.....	2	4
Nursing.....	47	440
Graduate nurses.....	46	431
Practical nurses.....	—	3
Physiotherapists.....	1	6
Sanitation.....	76	103
Engineers.....	41	14
Veterinarians.....	3	8
Sanitarians (holding college degrees).....	24	32
Others.....	8	49
Administration.....	14	4
Health education.....	12	10
Health educators (graduates of schools of public health).....	3	6
Others.....	9	4
Statistics.....	32	6
Statisticians (with academic statistical training).....	8	1
Others.....	24	5
Laboratory.....	222	30
Scientists (holding college degrees).....	122	21
Technicians.....	59	6
Ancillary workers.....	41	3
Secretarial.....	69	61
Nutrition.....	12	3
Social work.....	14	6
Venereal disease investigation.....	18	1
Other services.....	14	4
Total.....	585	718

<sup>1</sup> In Connecticut, Maryland, Michigan, and New York, which comprised the sample used in most of the analyses of the data.

prises in Colorado, Connecticut, Florida, Maryland, Michigan, and New York. Of these, 1,608 were employed in official agencies and visiting nurse associations, and 40 in voluntary health agencies. (Unless otherwise stated, the term

"local health departments" is used in this report to include visiting nurse associations.) The cooperation of the participating agencies was particularly gratifying.

The geographic distribution of the sample (with the exception of the 40 persons in voluntary health agencies) can be seen in table 1. Since Colorado and Florida were visited early in the course of the project, coverage was incomplete in these States in light of the criteria eventually established for the selection of personnel and the nature of the information to be elicited. Therefore, data obtained from these States were not included in most of the analyses.

Included in the study were all full-time, paid public health workers with professional, technical, or administrative responsibility for public health administration. Generally excluded were persons whose responsibilities were limited to clinical medicine, research, or hospital management or whose activities were uncommon in public health or were strictly routine. On this basis, most clerical workers were excluded, but secretaries with technical or administrative responsibilities were included.

If two or more employees performed essentially the same activities, only one of them was interviewed as representative of the group. The job activity information for this representative worker was duplicated for each worker with similar activities. As a result, it was possible to gain the desired information about the activities of the 1,303 persons who comprise the sample used in most of the analyses by interviewing 752, or 58 percent of them.

The personnel studied belonged to the medical, dental, nursing, sanitation, administration, health education, statistics, laboratory, secretarial, nutrition, social work, and venereal disease investigation services. The term service as used in this study refers to an administrative unit defined by the methods employed rather than the programs pursued. Services are frequently but not always synonymous with discipline. Thus, most nurses are members of a nursing service, but an occasional nurse is engaged in health education, hospital administration, or sanitation, for example.

The service classification of the participants in this study is shown in table 2. In terms of numbers, the major services in both State and local health departments were medical, nursing, sanitation, laboratory, and secretarial.

Position in the hierarchy of the organization also was used in the comparison of the various activities of public health workers. The composition of the sample according to administrative level is shown in table 3. For most purposes comparisons were made between high-echelon and staff personnel, but in some instances the executive and supervisor-consultant subdivisions of high-echelon personnel were used.

### Summary and Conclusions

The Yale Public Health Personnel Research Project was aimed at determining the activities of public health workers, their backgrounds,

**Table 3. Classification of personnel<sup>1</sup> by position in the administrative hierarchy and type of agency**

Position in the administrative hierarchy	State health departments	Local health departments and visiting nurse associations
<b>High-echelon personnel</b> .....	<b>171</b>	<b>161</b>
Executive personnel.....	99	80
Health officer.....	3	20
Assistant health officer.....	1	5
Program director.....	77	45
Assistant program director.....	12	6
Administrative assistant.....	6	4
Supervisor-consultant personnel.....	72	81
Consultant.....	53	19
Supervisor.....	19	62
<b>Staff personnel</b> .....	<b>414</b>	<b>557</b>
Senior staff.....	58	55
Junior staff.....	356	502
<b>Total</b> .....	<b>585</b>	<b>718</b>

<sup>1</sup> In Connecticut, Maryland, Michigan, and New York, which comprised the sample used in most of the analyses of the data.

and their personal reactions to their jobs. The study was an inventory, not an evaluation. In the course of the project, problems of scope, sampling, and method were encountered and were resolved more or less satisfactorily.

Interviews, with a minimum of formal direction on the part of the interviewer, were used to obtain information from the participants. A detailed universal code was developed for classifying the data, after it became evident by trial that the use of a separate code for each of several categories of personnel would limit the possibility of making comparisons.

The health departments participating in the

study were chosen as representative of "better than average" agencies. Because of the sample used, the findings may not necessarily have broad application to public health practice in the United States, but we think they do add to our meager knowledge.

One great handicap under which the project labored was the failure to provide for a complete pilot run before the major data-gathering commitments were undertaken. The development and testing of the investigative instruments and methods proved to be more significant in this study than the collecting of data.

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## Agencies Participating in Personnel Study

### Colorado

Colorado State Department of Public Health, Colorado State Tuberculosis Association, Denver Department of Health and Hospitals, Denver Tuberculosis Association, El Paso County Health Department, El Paso Visiting Nurse Association, El Paso Tuberculosis Association, Mesa County Health Department, Mesa County Cancer Society.

### Connecticut

Connecticut State Department of Health, Connecticut State Tuberculosis Association, Greenwich Department of Health, Greenwich Public Health Association, Hamden Department of Health, Hamden Visiting Nurse Association, Hartford City Department of Health, Hartford Tuberculosis Association, Hartford Visiting Nurse Association, New Britain Department of Health, New Britain Tuberculosis Association, New Britain Visiting Nurse Association, New Britain Cancer Society, New Haven Department of Health, New Haven Tuberculosis Association, New Haven Visiting Nurse Association, Waterbury Department of Health, Waterbury Tuberculosis Association, Waterbury Cancer Society.

### Florida

Florida State Board of Health, Alachua County Health Department, Broward County Health Department, Clay County Health Department, Dade County Health Department, Dade Visiting Nurse Association, Franklin County Health Department,

Highlands-Glades-Hendry District Health Department, Hillsborough County Health Department, Leon County Health Department, Volusia County Health Department, Volusia Visiting Nurse Association.

### Maryland

Maryland State Department of Health, Caroline County Health Department, Harford County Health Department, Howard County Health Department, Montgomery County Health Department, Washington County Health Department.

### Michigan

Michigan Department of Health, Michigan State Cancer Society, Michigan Tuberculosis Association, Calhoun County Health Department, Calhoun Tuberculosis Association, Chippewa-Luce-Mackinac District Health Department, District Health Department Number One, Kalamazoo County Health Department, Kalamazoo Tuberculosis Association, Kalamazoo Cancer Society, Oakland County Health Department, Oakland Tuberculosis Association, Ottawa County Health Department, Shiawassee County Health Department, Wayne County Health Department, Wayne County Tuberculosis Association, Wayne Out-County Chapter of the Michigan Society for Crippled Children and Adults.

### New York

Nassau County Health Department.

# Venereal Disease Among Teen-Agers

## —Its Relationship to Juvenile Delinquency—

By JAMES F. DONOHUE, B.S., M.P.H., GERALDINE A. GLEESON, A.B.,  
KENNETH H. JENKINS, B.S., and ELEANOR V. PRICE

**L**IMITATION of funds and personnel for venereal disease control has made it necessary to pinpoint insofar as possible the segments of the population in which venereal disease occurs most often and to which epidemiology can most effectively and profitably be applied. With this major objective, a project was initiated to collect morbidity data by age since up to this time only scattered information was available as to the age composition of reported cases.

With increasing attention being given to problems of youth, such data would also provide an opportunity to study the venereal disease problem among teen-agers. In addition, it was deemed important to determine the relative frequency of reported venereal disease among young adults as compared to older persons. It was anticipated that the findings from the analysis of these data would greatly increase our knowledge of the venereal disease problem, improve our case-finding efficiency, and heighten the accuracy of our estimates of the incidence and prevalence of syphilis and gonorrhea.

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*Mr. Donohue is chief statistician and Mrs. Gleeson, Mr. Jenkins, and Mrs. Price are statisticians in the Venereal Disease Program, Division of Special Health Services, Public Health Service. This paper is based on morbidity data furnished by State and city health departments.*

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Morbidity reports routinely submitted by State and city health departments indicate the number of cases reported by disease, stage of disease, race, sex, and reporting source, but do not provide any information relating to age. Reporting areas were therefore requested to prepare a special report of venereal disease cases by single years of age for all syphilis and gonorrhea cases reported in the calendar year 1953.

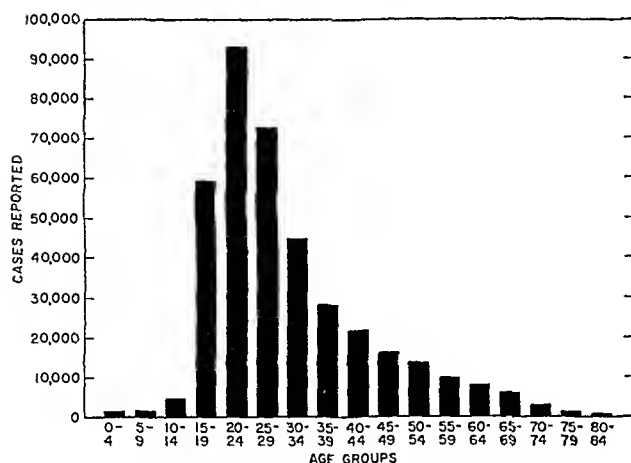
Response to this request was quite gratifying. Only one State and one large city were not able to submit tabulations by age. In terms of total cases, based on routine morbidity reports, 83 percent of syphilis cases and 77 percent of gonorrhea cases were reported by individual year of age. For purposes of this study, cases of unknown age have been prorated on the basis of known age distributions.

This report, the first to be published on this study, will consider in general that portion of the venereal disease problem which occurs among persons under 20 years of age and will relate these data to juvenile delinquency and other problems of youth.

Figure 1 shows the general pattern of the age distribution of the total cases of syphilis (all stages) and gonorrhea in the United States by 5-year age groups. A glance at the chart shows that the curve is peaked at the 20-24 year age group and is skewed to the right. The abrupt increase in cases at ages 15-19 years indicates how very serious the venereal disease problem is after age 14.

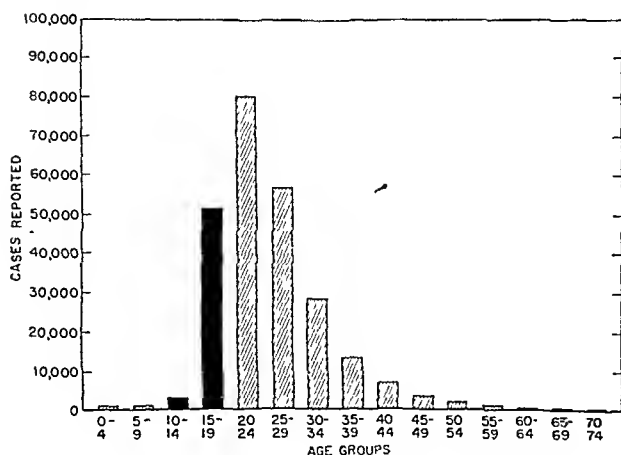


**Figure 1. Total cases of syphilis and gonorrhea reported in continental United States for the calendar year 1953, by age.**



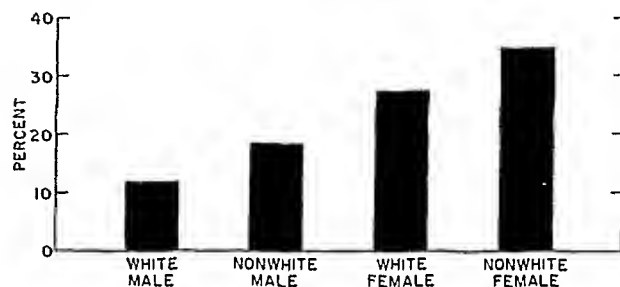
Epidemiology and the principles of preventive medicine can be applied most productively to the infectious stages of venereal disease. Figure 2 shows the age distribution of primary and secondary syphilis and gonorrhea by 5-year age groups. A higher proportion of the venereal disease cases in this chart are in the younger age groups than in figure 1 since syphilis cases of long duration are excluded. The chart represents the age distribution of fresh cases of venereal infections. Again there is a sharp increase in cases in the group aged 15-19 years.

**Figure 2. Cases of primary and secondary syphilis and gonorrhea reported in continental United States in the calendar year 1953, by age.**



It will be noted from table 1 that 22.4 percent of infectious venereal disease in the United States is reported among persons under 20 years of age. The proportion that infectious venereal disease is of the total syphilis and gonorrhea reported at any given year of age is also shown in table 1. It will be observed that this percentage increases from age 11 to a maximum at age 18 and then gradually decreases with age. Although this percentage represents all infectious venereal disease, it is believed that most of the infections at age 10 and below were probably acquired innocently.

**Figure 3. Percentage of total cases of infectious venereal disease reported among persons under 20 years of age, by race and sex.**



### Infectious Venereal Disease Under Age 20

Infections venereal disease is diagnosed more often among males than among females because of more obvious signs or painful symptoms in the male. However, blood testing surveys have shown that both sexes have equal syphilis prevalence rates. Another factor which must be considered is the very significant difference in both incidence and prevalence of venereal disease between whites and nonwhites. In analyzing the relative frequency of infectious venereal disease reported among teen-agers we must compare the number of cases under age 20 in each race-sex group with the total number of cases for that group to demonstrate how the percentage of infectious venereal disease under age 20 varies among the four race-sex groups.

Figure 3 shows how the percentage of infectious venereal disease in persons under age 20 varies with sex and race. The proportion of cases in this age group ranges from less than 12 percent among white males to more than 34 percent among nonwhite females. Females of both races have a higher proportion of cases in per-

sons under 20 years of age than do males, and for each sex, the rate for nonwhites is higher than the rate for whites. This is true for every State as well as for the Nation as a whole. Table 2 shows the percentage of infectious venereal disease cases for males and for females under age 20 for each of the 47 States participating in the study. Wide ranges occur between States, and percentages for all teen-agers vary from 9.6 percent to 33.9 percent.

Figure 4 presents the percentage of infectious venereal disease among persons under 20 years of age in the various States. It shows that the greater proportions by and large coincide with the States having the greater total venereal disease problems. These States have characteristically operated vigorous control programs

during the past decade, but their socioeconomic levels and the age and race distributions of their populations have placed them in a relatively unfavorable, although improving, situation with respect to most health problems. The high percentages of venereal disease among teen-agers in these areas are therefore a valid measure of how far the venereal disease control programs in these States have yet to go before the venereal disease aspect of their total youth problem compares favorably with that of States having low percentages of infectious venereal disease among their youth. We have used this percentage of infections venereal disease among persons under 20 years of age as an index of the venereal disease problem among teen-agers, and we have related it to other problems of youth.

**Table 1. Cases of primary and secondary syphilis and gonorrhea reported in continental United States, calendar year 1953, by age**

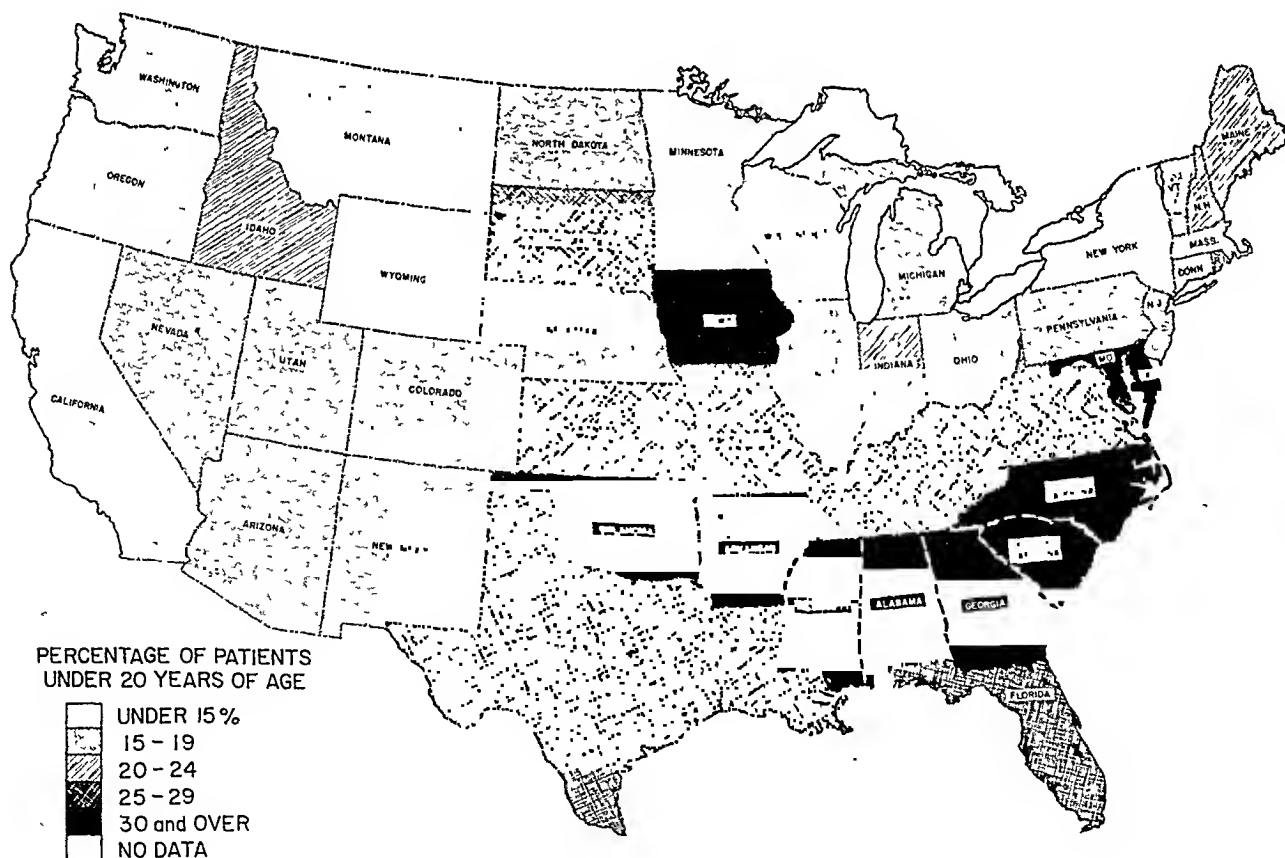
Age	Total syphilis and gonorrhea			Primary and secondary syphilis and gonorrhea			Percent primary and secondary syphilis and gonorrhea of total syphilis and gonorrhea
	Number	Percent	Cumulative percent	Number	Percent	Cumulative percent	
Less than 1.....	514	0.13	0.13	206	0.08	0.08	40.08
1.....	192	.05	.18	51	.02	.10	26.56
2.....	225	.06	.24	138	.06	.16	61.33
3.....	196	.05	.29	137	.06	.22	69.90
4.....	235	.06	.35	162	.07	.28	68.94
5.....	271	.07	.42	158	.06	.34	58.30
6.....	313	.08	.50	159	.06	.40	50.80
7.....	321	.08	.58	136	.06	.46	42.37
8.....	312	.08	.66	114	.05	.51	36.54
9.....	340	.09	.75	114	.05	.56	33.53
10.....	381	.10	.85	100	.04	.60	26.25
11.....	356	.09	.94	73	.03	.63	20.51
12.....	586	.15	1.09	200	.08	.71	34.13
13.....	1,085	.28	1.37	619	.25	.96	57.05
14.....	2,242	.58	1.95	1,612	.65	1.61	71.90
15.....	4,174	1.08	3.03	3,322	1.35	2.96	79.59
16.....	7,369	1.90	4.93	6,208	2.51	5.47	84.24
17.....	11,710	3.03	7.96	10,312	4.18	9.65	88.06
18.....	17,504	4.52	12.49	15,483	6.27	15.91	88.45
19.....	18,499	4.78	17.27	16,072	6.51	22.42	86.88
20-24.....	93,390	24.14	41.41	80,306	32.52	54.94	85.99
25-29.....	72,935	18.85	60.26	56,729	22.97	77.91	77.78
30-34.....	44,553	11.51	71.77	28,349	11.48	89.39	63.63
35-39.....	28,411	7.34	79.11	13,072	5.29	94.68	46.01
40-44.....	21,922	5.68	84.78	6,774	2.74	97.42	30.90
45-49.....	16,112	4.16	88.94	3,201	1.30	98.72	19.87
50-54.....	13,569	3.51	92.45	1,698	.69	99.40	12.51
55-59.....	9,924	2.56	95.02	753	.30	99.70	7.59
60-64.....	8,020	2.07	97.09	383	.16	99.86	4.78
65-69.....	6,045	1.56	98.65	216	.09	99.95	3.57
70-74.....	3,008	.78	99.43	86	.03	99.98	2.86
75-79.....	1,398	.36	99.79	27	.01	99.99	1.93
80+.....	801	.21	100.00	7	.00	100.00	.87
Total.....	386,913	100.00	-----	246,977	100.00	-----	63.83

**Table 2. Percentage of all gonorrhea and primary and secondary syphilis cases reported among persons under 20 years of age by State**

State	Male	Female	Total	State	Male	Female	Total
Connecticut.....	6.0	25.4	9.6	Wisconsin.....	8.8	25.2	13.6
Maine.....	13.3	48.8	23.7	Iowa.....	16.2	51.2	32.7
Massachusetts.....	5.7	25.1	10.9	Kansas.....	17.6	39.8	27.4
New Hampshire.....	0	42.1	20.0	Minnesota.....	7.2	20.9	11.2
Rhode Island.....	10.4	36.7	16.7	Missouri.....	20.1	37.3	25.8
Vermont.....	13.5	21.1	16.1	Nebraska.....	10.7	24.5	17.2
Delaware.....	26.5	50.0	33.9	North Dakota.....	N. D.	N. D.	18.5
New Jersey.....	12.3	29.6	17.3	South Dakota.....	27.0	42.2	28.1
New York.....	9.4	24.6	11.6	Arkansas.....	25.3	41.1	33.2
Pennsylvania.....	14.3	31.2	19.4	Louisiana.....	22.1	35.7	26.7
District of Columbia.....	N. D.	N. D.	N. D.	New Mexico.....	15.0	27.3	19.1
Kentucky.....	21.0	33.8	25.3	Oklahoma.....	24.0	40.0	31.7
Maryland.....	24.2	48.6	31.6	Texas.....	22.2	36.6	27.9
North Carolina.....	24.4	42.2	31.3	Colorado.....	9.2	24.1	15.6
Virginia.....	22.1	32.2	27.9	Idaho.....	12.4	35.9	22.3
West Virginia.....	17.6	38.9	29.4	Montana.....	3.4	25.0	11.3
Alabama.....	27.8	45.7	33.5	Utah.....	11.5	32.3	18.5
Florida.....	22.8	34.7	26.3	Wyoming.....	N. D.	N. D.	N. D.
Georgia.....	27.1	38.6	31.5	Arizona.....	15.3	32.6	19.1
Mississippi.....	24.4	39.2	30.0	California.....	9.8	25.1	14.1
South Carolina.....	25.2	42.2	30.5	Nevada.....	14.6	33.3	19.3
Tennessee.....	19.5	32.9	25.8	Oregon.....	6.0	31.5	12.7
Illinois.....	10.6	25.3	14.3	Washington.....	6.1	20.0	11.8
Indiana.....	15.7	38.8	23.0				
Michigan.....	16.3	24.5	19.7				
Ohio.....	10.0	23.5	14.1				

N. D.—No data.

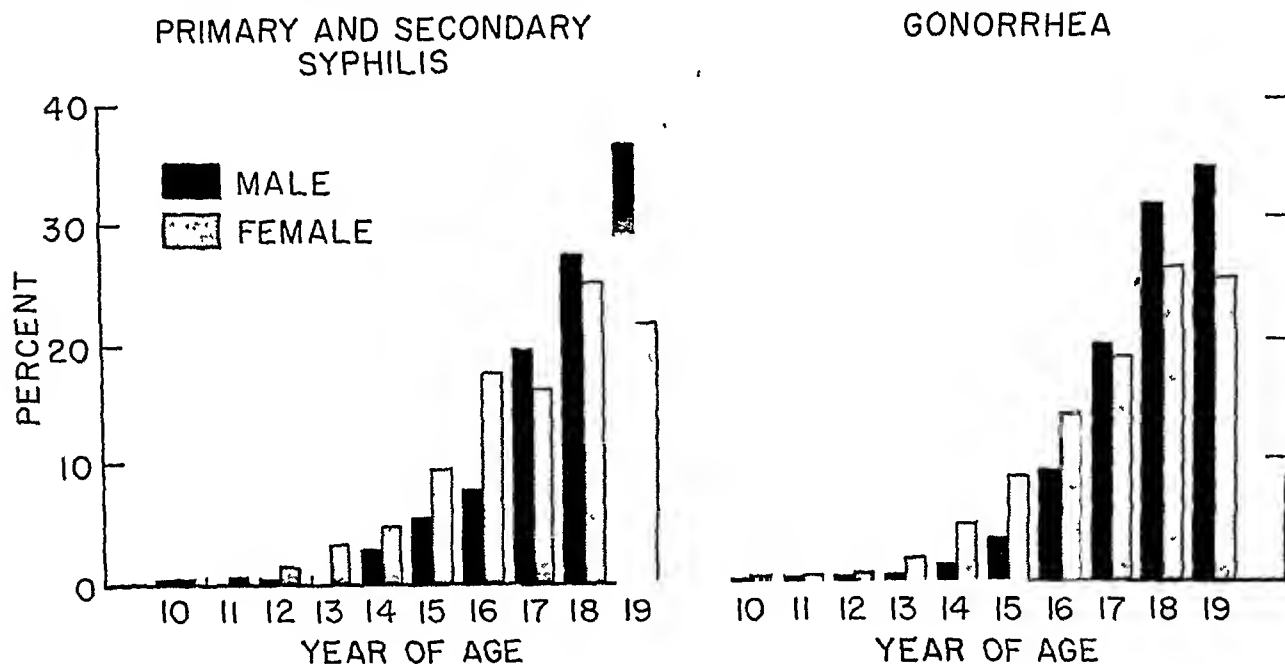
**Figure 4. Infectious venereal disease among teen-agers in the United States.**



Infectious venereal disease reported in persons 10–19 years of age is separated in figure 5 into its two components, primary and secondary syphilis and gonorrhea, in an effort to distinguish sexually acquired from nonsexually acquired infections. It will be observed that the age distribution for primary and secondary syphilis, which is rarely nonsexually acquired,

Table 3 and figure 6 show the cumulative percentages of infectious venereal disease cases in persons 10–19 years of age, by sex. Since there were no appreciable differences in the percentage distributions by race, these data were not shown separately by race. The cumulative percentage of infected females is higher than the cumulative percentage of infected males at

Figure 5. Percentage distribution of cases of primary and secondary syphilis and of gonorrhea reported among males and females aged 10–19 years.



is in general the same as for gonorrhea. In both diseases, the upward swing begins in females at age 12 and in males at age 14, and illustrates the point that infectious venereal disease is sexually acquired at a much earlier age than has been realized. Females have a higher proportion of cases than males in the earlier years up to age 17, at which age the percentage in males becomes higher than in females. As a matter of fact, the 18th year of age is the modal year for all females, whereas the male frequency continues to increase with age into the early twenties. The dip at age 17 among females with primary and secondary syphilis is not explainable unless females at that age claimed to be a year older than they were. This phenomenon does not appear in the gonorrhea distribution, however.

each age from 10 through 18 years. The greatest difference in cumulative percentage is at age 16 where the difference is 15.9 percent. The curves indicate that 50 percent of the females in the group 10–19 years of age become infected by the time they reach the age of 17.5 years whereas 50 percent of the males become infected by the time they reach the age of 18.0 years. The quartile horizontal line shows that 25 percent of the females are infected by age 16.1 years whereas one-fourth of the males become infected by age 17.0 years.

Charts 7–11 are scatter diagrams, which present a graphic picture of the association between infectious venereal disease among teen-agers and certain other problems of youth. The rate (or percentage) of infectious venereal disease cases among persons under 20 years of age in a

**Table 3. Cases of infectious venereal disease reported among males and females aged 10-19 years**

Age	Sex						Excess of female over male
	Male			Female			
	Number	Percent	Cumulative percent	Number	Percent	Cumulative percent	Cumulative percent
10-----	16	0.08	0.08	58	0.28	0.28	0.20
11-----	15	.07	.15	48	.23	.51	.36
12-----	37	.18	.32	129	.62	1.12	.80
13-----	71	.34	.66	418	2.00	3.12	2.46
14-----	289	1.37	2.02	984	4.71	7.83	5.81
15-----	752	3.56	5.58	1,836	8.78	16.61	11.03
16-----	1,921	9.09	14.67	2,915	13.94	30.55	15.88
17-----	4,142	19.60	34.27	3,876	18.53	49.08	14.81
18-----	6,606	31.25	65.52	5,428	25.96	75.03	9.51
19-----	7,288	34.48	100.00	5,221	24.97	100.00	.00
Total-----	21,137	100.00	-----	20,913	100.00	-----	-----

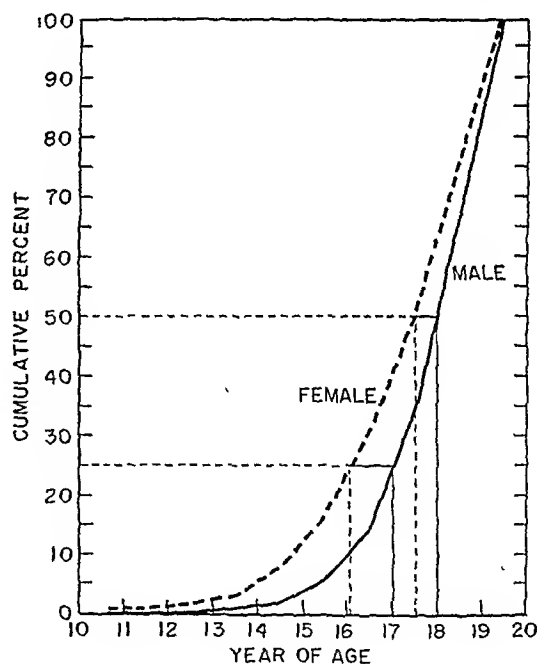
State is plotted on the  $X$ -axis, and the extent of other youth problems is plotted on the  $Y$ -axis. Each point represents a State for which measures of both variables are available.

It should be mentioned that a significant coefficient of correlation does not necessarily indicate a *causal* relationship but does illustrate that a definite association exists between two variables within the same segment of the population.

The degree of association between two series plotted as indicated above is calculated by the correlation method and is measured in relative terms by the coefficient of correlation which ranges in numerical value from 0 to  $\pm 1$ . A value of  $+1$  would mean that there is a perfect direct relationship, that is, an increase in  $X$  results in a definite increase in  $Y$ . A value of  $r = 0$  would indicate that there is no association whatsoever between the two variables, and a value of  $r = -1$  would mean a perfect inverse relationship. Rarely would one expect to find such values of a coefficient correlation computed from actual data. The less perfect the relationship between the two variables, the greater the departures (or scatter) from the line of regression.

All correlations shown in this paper have been tested for statistical significance. All but one were significant at the 1-percent level, meaning that there is less than 1 chance out of 100 of finding such a degree of correlation by

**Figure 6. Cumulative percentage distribution of infectious venereal disease reported among males and females aged 10-19 years.**

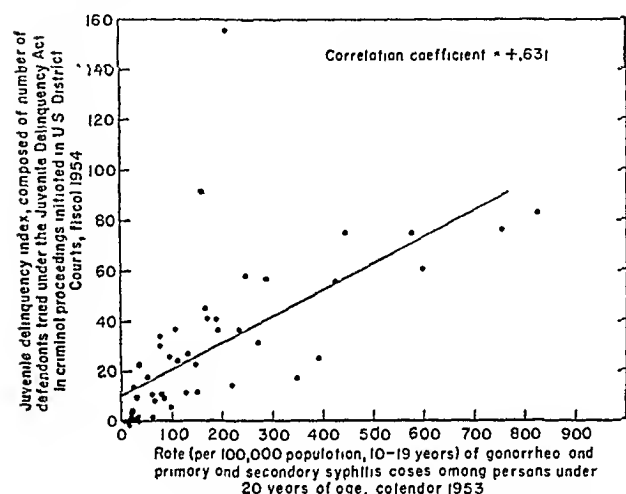


chance in unassociated data. The single exception is the correlation relating venereal disease and illegitimacy (fig. 8), which was significant at the 2-percent level.

It should be mentioned that there is a paucity of statistics on juvenile delinquency which are comparable from State to State. The problem

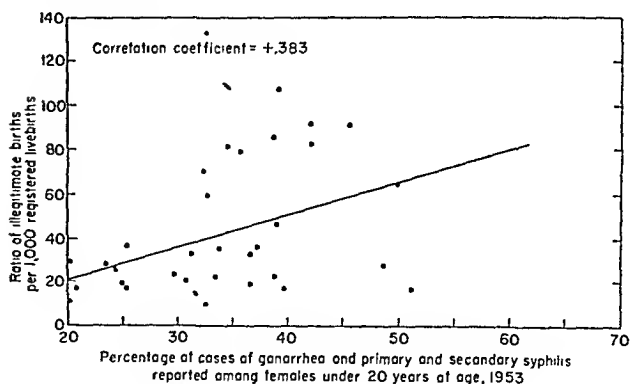
is that the laws and interpretations of laws concerning juvenile delinquency vary greatly between States. In fact, interpretations vary within States. Variable factors include age, sex, nature of crime, conditions in home, status of parents, intelligence of juvenile, education, probation, court procedures, and so on. Furthermore, there is no standard procedure for reporting juvenile delinquency statistics, and many States do not even have a central reporting agency for juvenile court statistics.

**Figure 7. Scatter diagram relating infectious venereal diseases and juvenile delinquency reported by 47 States.**



The only available data on juvenile delinquency which are statewide in coverage and which meet the criteria of consistency between States appear in the annual report of the Administrative Office of the United States Courts (1). The number of defendants in criminal proceedings tried under the Juvenile Delinquency Act (Title 18, sec. 5031) in the United States district courts is used as an index of juvenile delinquency in each State. Figure 7 shows the number of cases of infectious venereal disease per 100,000 population under 20 years of age in 47 States plotted against a juvenile delinquency index for each State, based on the number of defendants in criminal proceedings initiated in United States district courts during fiscal year 1954. The coefficient of correlation was equal to plus .631, which indicates a significant positive association between the infectious venereal disease rate among teen-agers and ju-

**Figure 8. Scatter diagram relating infectious venereal disease and illegitimacy reported by 32 States.**

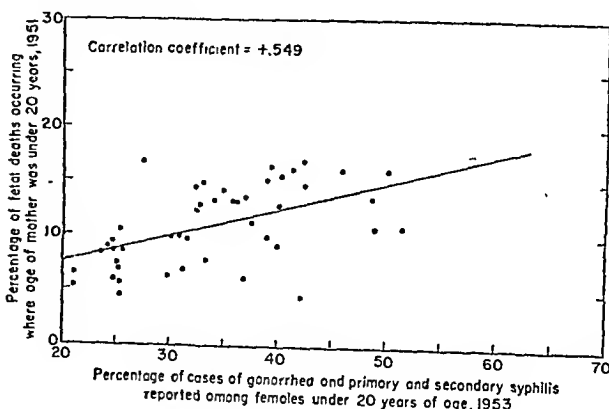


venile delinquency as represented by the number of criminal proceedings for Federal offenses among the same age group population.

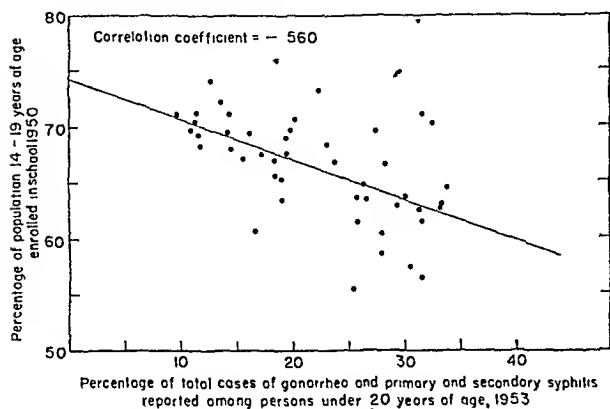
The dependent variables in the remaining figures are statistical data concerning problems of the same population segment as published by the National Office of Vital Statistics and the Census Bureau. In figure 8 the percentage of cases of infectious venereal disease among females under 20 years of age is plotted against the illegitimacy ratio reported in 32 States, which is used as a measure of promiscuity (2). The coefficient of correlation was equal to plus .383, which indicates a positive association between the percentage of infectious venereal disease among female teen-agers and the ratio of illegitimate births per 1,000 live births registered.

Figure 9 shows the percentage of cases of infectious venereal disease among females un-

**Figure 9. Scatter diagram relating infectious venereal disease and fetal deaths reported by 46 States.**



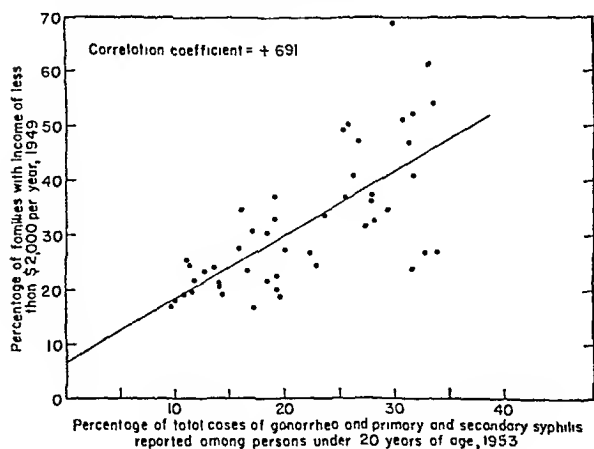
**Figure 10. Scatter diagram relating infectious venereal disease and school enrollment reported by 47 States.**



der 20 years of age plotted against the percentage of fetal deaths (abortions, miscarriages, and stillbirths) occurring among mothers under 20 years of age reported by 46 States (2). The coefficient of correlation was plus .549 and indicates that a significant association exists between venereal disease and fetal deaths among teen-age mothers. This does not mean that venereal disease necessarily caused the fetal deaths, although venereal disease among pregnant women can result in disastrous outcome.

The percentage of infectious venereal disease among persons under 20 years of age is plotted in figure 10 against the percentage of the population 14-19 years of age enrolled in school (3) in 47 States. The coefficient of correlation was minus .560, which indicates a significant inverse

**Figure 11. Scatter diagram relating infectious venereal disease and extent of low family income, reported by 47 States.**



relationship between percentage of school enrollment and the percentage of infectious venereal disease among persons under 20 years of age. This negative association indicates that the higher the percentage of teen-agers in school the lower the venereal disease attack rate among this age group.

Figure 11 shows the percentage of total cases of gonorrhea and primary and secondary syphilis reported among persons under 20 years of age plotted against the percentage of families with incomes of less than \$2,000 per year (3). The coefficient of correlation was plus .691 and indicates that there exists a significant positive association between venereal disease and this measure of financial status. This should be expected since it is well known that the lower the socioeconomic level the higher the venereal disease rate.

## Discussion

All the evidence presented points to the fact that there is a definite degree of association between teen-age venereal disease and other problems of youth. The extent of venereal disease among teen-agers varies directly with criminal proceedings for Federal offenses among the same age group, promiscuity among persons under 20 years of age, fetal deaths among teen-age mothers, and lack of financial stability and varies inversely with educational status. This latter point is the one encouraging aspect of the problem since the higher percentage of juveniles enrolled in school, the lower the venereal disease attack rate in this age group.

The meaning of venereal disease among teen-agers might be interpreted in several ways. It could be argued that in a country where there is considerable incidence of infectious venereal disease, it is only natural that sexually active teen-agers account for a substantial proportion of all venereal infections. On the other hand, a youngster infected with a venereal disease has obviously deviated from the accepted pattern of approved social behavior. In this sense, venereal disease itself might be considered a manifestation of the broad problem of juvenile delinquency.

These correlations highlight again an im-

portant phase of the Nation's prospects in the field of health: The protection which adequate income, wise and well-organized communities, and familial and social guidance can give to our American youth has indirect benefits in the field of health. The correlations indicate that venereal disease is but one of the problems to which our less-protected and therefore less-privileged youth is exposed.

Current indications of increases of venereal disease in many States, recent outbreaks of venereal disease involving high percentages of teen-agers, and the extensive juvenile delinquency which has recently been of so much general concern highlight the serious problem which exists in our venereal disease control program and to which our utmost efforts must now be directed.

That the venereal disease program, as well as other health programs, was able during the last decade to make headway in the presence of other youth problems arises largely from the fact that the techniques of case finding, diagnosis, and treatment, vigorously supported with

local, State, and Federal funds, acquired a momentum greater than the speed at which these diseases were transmitted. This reduction in incidence and prevalence of venereal diseases among teen-agers might be envisioned not only as a specific accomplishment in disease control but as part of our total effort toward giving youth protection against the many hazards of growing up; as part of the Nation's effort to create a favorable climate and soil for its most important product.

#### REFERENCES

- (1) U. S. Administrative Office of the United States Courts: Annual report of the director. Washington, D. C., U. S. Government Printing Office, 1954.
- (2) U. S. National Office of Vital Statistics: Vital statistics of the United States: 1951. I. Analysis and summary tables. Washington, D. C., U. S. Government Printing Office, 1954.
- (3) U. S. Bureau of the Census: United States census of population. II. Characteristics of the population. Part 1. Summary. Washington, D. C., U. S. Government Printing Office, 1953.

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### Legal Note on Commitment of Insane Federal Prisoners

The United States Court of Appeals for the Eighth Circuit, in an opinion dated February 14, 1955, held that any insane or mentally incompetent Federal prisoner may be committed to the custody of the Attorney General regardless of the probable duration of his illness, *Greenwood v. United States*, 23 U. S. L. Week 2411.

This decision is in conflict with prior cases from two other circuits, the 9th and 10th. In the cases of *Wells v. Attorney General*, 201 F. 2d 556 (C. C. A. 9th. 1953), and *Higgins v. United States*, 205 F. 2d 650 (C. C. A. 10th, 1953) it was held that such commitments must be limited to temporarily insane prisoners pending their trial since any attempt by Congress to authorize the commitment of other than temporarily insane prisoners would be

unconstitutional as an invasion of the general field of lunacy which is reserved to the States by the 10th amendment. The *Wells v. Attorney General* case was noted in the August 1953 issue of *Public Health Reports*, page 825.

In the *Greenwood* case, however, the court held that the power to provide for the commitment of insane or incompetent prisoners to the custody of the Attorney General was a necessary incident to the power to provide for the enforcement of the Federal criminal laws. With regard to the invasion of the "general field of lunacy," the court said that: "No valid objection can be based upon the fact that such exercise may be attended by the same incidents which attend the exercise by a State of its police power, or that it may tend to accomplish a similar purpose."



# Ophthalmia Neonatorum

By C. A. SMITH, M.D., and LAURA HALSE, M.S., LL.B.

ONE of the most dramatic and heartwarming achievements of the effort to control venereal disease has been the reduction of blindness in babies resulting from infection with gonorrhea by the mother during birth. The great advances in the prevention of ophthalmia neonatorum were made before the era of sulfonamides and the antibiotics; they resulted from the very simple, so it seems now, procedure of placing silver nitrate solution or other effective silver preparation in the eyes of the child immediately after birth. These preparations of little value in treatment once the disease is established, are highly effective in preventing infection in the eye. Simple as the procedure was its introduction as part of the routine health and medical practice resulted in widespread and inspired activity by various health groups. The story of these efforts is well known in order to understand the present infectious disease family and practices.

Gonorrheal infection in the eye is a so-called gonorrheal ophthalmia. It is swift and severe. If untreated it results in blindness in a very short time. Without treatment, about 90 percent of babies infected with ophthalmia neonatorum

come blind. The most common means of infection is through contact of the mother's eyes during passage of the baby's head. However, infection can occur if they are contacted by other individuals.

These presented points to the environment is a definite degree of association

Signs of teen-age venereal disease and other ailments of youth. The extent of venereal disease among teen-agers varies directly with criminal proceedings for Federal offenses among the same age group, promiscuity among persons under 20 years of age, fetal deaths among teen-age mothers, and lack of financial stability and varies inversely with educational status. This latter point is the one encouraging aspect of the problem since the higher percentage of juveniles enrolled in school, the lower the venereal disease attack rate in this age group.

The meaning of venereal disease among teen-agers might be interpreted in several ways. It could be argued that in a country where there is considerable incidence of infectious venereal disease, it is only natural that sexually active teen-agers account for a substantial proportion of all venereal infections. On the other hand, a youngster infected with a venereal disease has obviously deviated from the accepted pattern of approved social behavior. In this sense, venereal disease itself might be considered a manifestation of the broad problem of juvenile delinquency.

These correlations highlight again an im-

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40  
and secondary syphilis  
page, 1953

In 1808, Gibson, an English obstetrician, observed a connection between the strange malady known as "babies' sore eyes" and the discharge present in the birth canal of the mother (3). He reported that careful cleansing of the mother's body and the wiping of mucus from the baby's eyes after birth might prevent an infection which often led to lifelong blindness. But his colleagues paid little attention to his advice. At that time, in accordance with prevalent theories on causation of disease, doctors explained to mothers of babies who had lost their eyesight at birth that this condition was due to such causes as the peculiar constitution of the atmosphere or sudden changes of temperature. Colds were assumed to be the cause of inflamed eyes. This belief was so widespread that Cortez, the Spaniard, in 1837 decreed that all babies should be baptized with warm water instead of cold water.

In 1820, Vetch, by experimental inoculation of female genital secretion, was able to produce ocular inflammation, suggesting the truth of Gibson's assertion (4). In 1879, Albert Neisser, an assistant professor in the University Clinic of Dermatology at Breslau, described a micrococcus that he believed to be the cause of gonorrhea (5). His discovery attracted universal attention, coming at a time when the science of bacteriology was developing and numerous investigators in the bacteriological and pathological fields were beginning to carry on research. However, there was considerable doubt in the minds of many scientists as to the rôle played by the gonococcus in the production of gonorrhea. This was finally resolved by experimental genital inoculation of both gonococcal discharge and cultured gonococci. Then, in 1881, Hirschberg and Krouse demonstrated the gonococcus in patients with ophthalmia neonatorum (6).

In spite of discovery of the causative agent of gonococcal infections, therapy for both genital and ocular infections was highly unsatisfactory. The multiplicity of treatment schedules suggested attests to the essential lack of value of any one of them. Thus, as might have been expected, much attention was given to potential means of prevention of ocular infection.

In 1856, Dr. Karl Sigmund Franz Credé was made director of the lying-in-hospital in Leipzig (7). After years of experimental studies, he found an agent which would prevent ophthalmia neonatorum. In 1886 he published his epochal treatise (8) in which he stated, "... if two percent solution of silver nitrate is dropped in the eyes of newborn infants, immediately after birth, the pus germs producing ophthalmia neonatorum could be killed and the development of the disease prevented." His records showed that the disease developed in only 0.17 percent of the cases in which silver nitrate was used, whereas it developed in 10 percent of the cases in which the solution was not used.

Credé's theory and demonstration were not immediately accepted and were, in fact, met by widespread opposition. However, as knowledge of his experience spread, other clinicians began to apply his findings.

In the United States, Dr. Lucien Howe (7) became the leader in the fight against ophthalmia neonatorum. He went to Egypt in 1887 and studied purulent ophthalmia; when he returned to the United States he began his campaign against ophthalmia neonatorum. He established and became the director of the Howe Laboratory of Ophthalmology at Harvard, endowing this institution with \$1 million from his own fortune. He campaigned in many States for passage of legislation and drew up model laws for the prevention of this disease. It was largely through his efforts that early legislation for compulsory instillation of silver nitrate in the eyes of newborn children was passed. Dr. Howe was so forceful in his pleas for prevention of blindness that he aroused the New York State Medical Society and the American Ophthalmology Society to become actively responsible for legal work for the control of the disease.

In 1905, influenced by Dr. Howe, the New York City Health Department sent out a bulletin instructing all midwives in the use of Credé solution of silver nitrate in the eyes of the newborn child. The bulletin also reemphasized that all sore eyes must be reported to the health department so that medical investigation could be instituted and treatment given when necessary.

The Governor of New York was so impressed by Dr. Howe's enthusiasm and energy that in 1906 he appointed him to the Commission to Investigate the Conditions of the Blind. Dr. Howe and Dr. Park Lewis, president of the commission, assisted in promoting a detailed census of the blind in New York State, which they presented to the legislature in 1907 (7). They were also instrumental in establishing the National Society for Prevention of Blindness.

### National Society

Included in the report of the census of the blind in New York State was an article by Dr. Lewis entitled "Needlessly Blind," in which, referring to ophthalmia neonatorum, he said ". . . this is a disease the nature of which is fully understood, which might have been controlled or avoided by simple prophylactic or therapeutic measures at the time the infant came into the world."

In 1908, Louise Lee Schuyler read Dr. Lewis' article and became determined to start a movement to acquaint the public with the menace of ophthalmia neonatorum (7), and it was her leadership and intelligence which did so much to popularize the movement and which gave real drive to it. With Edith Holt, she organized groups to discuss ways and means of influencing the legislature and of educating the public in the necessity of using prophylaxis to prevent blindness. Miss Schuyler and Miss Holt then organized the New York State Committee for Prevention of Blindness, a private organization.

It soon became apparent to this committee that blindness was a problem of national importance and in 1915, the National Society for the Prevention of Blindness—a lay organization cooperating actively with the medical profession, particularly ophthalmologists, and with official and volunteer health agencies—was organized. The State committee then became a standing committee of the national society.

The objectives of the national society were:

1. To endeavor to ascertain, through study and investigation, any causes, whether direct or indirect, which may result in blindness or impaired vision.

2. To advocate measures which shall lead to elimination of such causes.

3. To disseminate knowledge concerning all matters pertaining to care and use of the eyes.

In the beginning, the society established a cooperative relationship with agencies and societies, official and volunteer, which had either a direct or an indirect responsibility for the prevention of blindness and the conservation of vision. In 1925, it established such a relationship with the Conference of State and Provincial Health Authorities of North America.

The society prepared and distributed literature of particular interest to ophthalmologists, first securing from them approval of the material, and provided slides and moving pictures for use in lectures. It continues to prepare and distribute literature but no longer has slides and moving pictures available.

In 1928, as a result of educational work by the national society, and recognizing the need for preventive work, the New York Commission for the Blind established a department of prevention of blindness and made Sarah Clendinning, R. N., the director. Under Miss Clendinning's leadership, groups were reached through lectures on the prevention of ophthalmia neonatorum.

### Statistics

In 1908, ophthalmia neonatorum was responsible for 28 percent of the blindness among new entrants in blind schools (9). In 1933, 11 percent of the new entrants in these schools were blind from this disease; by 1950 this figure had been reduced to 1 percent.

In 1923, Dr. Taliaferro Clark and Dr. J. W. Kerr of the Public Health Service wrote: "It has been conservatively estimated that ophthalmia neonatorum is responsible for 20 percent of blindness in the United States. Blindness is not a reportable disease; therefore, statistics had to be gathered largely from institutions for the blind throughout the United States. For this reason, the figures compiled represent only those children that are institutionalized in blind schools" (7).

A report issued in 1926 (10) showed that in 1907, 28 percent of the blindness in the United States was due to ophthalmia neonatorum; in

1913-17, blindness from this cause had dropped to 19 percent; in 1918-22, it was 16.5 percent; and by 1926, or within 18 years, a decrease of 51.3 percent had occurred.

Before 1930, the most complete and authentic information on the blind was assembled by the Bureau of the Census (11). However, this information was incomplete. Only a few State commissions had compiled reports of ophthalmological findings. For causes of blindness, the Bureau of the Census could give only data based on the statements made by blind persons themselves instead of reports of ophthalmological examinations. In many ways, the data were inconsistent and inadequate and often were completely lacking. A special conference was called by the American Foundation for the Blind and the National Society for the Prevention of Blindness to discuss methods of improving statistics on blindness. In 1930, the Committee on Statistics of the Blind was organized and still is sponsored and financed jointly by these two groups.

### Early Enactments

In 1922, the Sanitary Code of New York City stated (12) ". . . it shall be the duty of every physician, nurse, midwife, or other person in attendance on a confinement case to instill in the eyes of a newborn child immediately after delivery—1 percent solution of silver (nitrate) or an equally effective agent in order to prevent the development of ophthalmia neonatorum."

In 1926, according to a report by the National Society for the Prevention of Blindness, 20 States had definite enactments requiring the use of prophylaxis in the eyes of every newborn child. (Fifteen of these were Alabama, Arizona, Delaware, Georgia, Idaho, Iowa, Maryland, Michigan, Missouri, Rhode Island, Tennessee, Texas, Virginia, West Virginia, and Wisconsin.) Five States—Indiana, Louisiana, North Dakota, Utah, and Washington—had definite enactments requiring the use of prophylaxis under certain qualifying conditions. In 12 States, regulation was under State board of health rulings; Florida and Montana had no law. Thirty States required that the birth certificate indicate whether or not prophylaxis

was used and the strength of the prophylactic agent.

### Control Measures

Public health workers recognize that the general public is not interested in health per se; a desire for good health is not a dynamic force in securing action to attain it. Even the understanding of the cause of a tragic disease is not essential to action. This situation is exemplified in the ophthalmia neonatorum control program. The cause of the disease is gonorrhea in the mother, yet the early campaigners for preventive legislation practically never mentioned this. They issued pamphlets citing the number of children that were "needlessly blind" because of lack of proper medical care. They discussed methods of educating the public to realize the necessity for using prophylactic measures to prevent "babies' sore eyes" and discussed ways and means of influencing State legislators to pass preventive legislation.

The one exception to this approach was through Dr. William Snow, chairman of the American Social Hygiene Association, an enthusiastic supporter of the program of the National Society for the Prevention of Blindness. He reiterated the known fact that ophthalmia neonatorum would be prevented if gonorrhea were wiped out. At an annual meeting of the American Social Hygiene Association he stated ". . . there are approximately 200,000 blind persons throughout the country and it is estimated that more than 15 percent of those lost their sight because of syphilis and gonorrhea. It is obvious that there is a close relationship between the movement to prevent blindness and the drive to stamp out these diseases."

The campaign for prevention of blindness in babies was directed by and to the socially and economically secure groups. The support of these articulate and well-informed groups has been an important factor in obtaining legislation which required prophylaxis in the eyes of the newborn child. The campaign to eradicate venereal disease during the years 1920-29, although the opposition was neither specific nor ephemeral, did not parallel the success of the ophthalmia neonatorum prevention program. The venereal disease program appeal was made

primarily to middle-class groups, who at that time were reluctant to discuss publicly "sex and social hygiene."

Perhaps control of blindness among babies depends, in the final analysis, upon motivation of the physician, the nurse, or the midwife only, whereas control of venereal disease depends upon the motivation of many individual patients.

The Public Health Service during this period, 1920-29, cooperated with the States in establishing training services in epidemiological studies and research laboratories to determine the causes of blindness. Data were gathered regarding legal provisions for the prevention of ophthalmia neonatorum. Reports concerning venereal diseases as a cause of blindness were published and distributed to State health departments.

### *Federal, State, Local*

Federal authority in health matters does not extend to participation in the exercise of police powers of the State. Federal authority is concerned with interstate and international health problems. The police powers relating to health, safety, and morals within the State borders have been reserved specifically to the States themselves.

The administration of public health in a State is a significant part of general administration. The physician in charge of a State health department has a dual responsibility in the enforcement of health regulations: he must furnish expert professional advice to the State legislators, and, as an administrative officer in the health department, he must protect the health of the people through the control or eradication of disease.

Pennsylvania's experience illustrates State efforts to control ophthalmia neonatorum. In November 1931, the Pennsylvania State Board of Health began an active campaign against ophthalmia neonatorum (13). A State law had been passed in 1913, but it left the procedures to be worked out and enforced by the State board of health. The board of health had issued regulations making mandatory instillation of one drop of silver nitrate in the eyes of a newborn child, defined "inflammation" of

babies' eyes," and required that any evidence of this infection be reported to the local health department. The 1931 campaign, 18 years after passage of enabling legislation, was the result of the widespread failure of physicians or attendants at childbirth to carry out the provisions regarding instillation of a prophylaxis in the eyes of a newborn child, and to report immediately any indication of "sore eyes in a newborn infant."

In the spring of 1951, it came to the attention of Dr. Theodore Appel, secretary of the State board of health, that, of the total enrollment of 289 children in the Overbrook School for the Blind, 51 were blind as the result of ophthalmia neonatorum; and 6 of 45 children who had entered the school the previous year were blind from ophthalmia neonatorum. This situation occurred in spite of the fact that, in Pennsylvania, application of prophylactic treatment to the eyes of a newborn child was mandatory and that "sore eyes" were reportable. Dr. Appel sent out letters to all county medical officers which said, "This Department is deeply concerned to have this law obeyed, and is prepared to enforce it, carrying cases into court when necessary."

### *Private Organizations*

Although State and local authorities are responsible for enforcing health measures, the forces back of most State health legislation are the volunteer groups and private agencies. It was these groups that organized State societies for the prevention of blindness in newborn children; they all became active in preparing legislation to be enacted to prevent ophthalmia neonatorum.

The Illinois Society for Prevention of Blindness is an excellent example of this type of organization (14). In 1927, this society began its campaign for passage of legislation making it mandatory that a prophylaxis be instilled in the eyes of a newborn child. Audrey Hayden Gradle, executive secretary of the society, made a survey of the blind in Illinois, which showed that during the years 1921-30, in Chicago, 1,294 babies were hospitalized with ophthalmia neonatorum and 77 babies became blind as a result of this disease. Mrs. Gradle enlisted the sup-

port of many organizations: the Illinois State Medical Society, the State Board of Health, the Parent-Teacher Association, the women's clubs, Lions clubs, and the State Social Hygiene Association. Dr. William Snow of the American Social Hygiene Association assisted Mrs. Gradle by helping her organize standing committees and by making speeches throughout Illinois.

A bill for the prevention of ophthalmia neonatorum was drawn up with the assistance of the law department of Chicago University. It was fought bitterly by antimedical groups whose opposition to medical treatment was based on religious grounds and who flooded the legislature with protests. At that time, very few bills with social welfare implications survived the committee readings. (In Illinois, such bills must have three readings in both the House and the Senate committees and a favorable opinion by the attorney general before they are presented to the legislature for passage.)

An amendment to the bill, sponsored by the antimedical groups, was voted down 112 to 4. This amendment provided that if parents or guardians objected to the use of prophylaxis on grounds of religious beliefs, those persons would be exempt from the law. The original bill passed the Illinois Legislature and was sent to the Governor for his signature. The attorney general gave an adverse opinion that "police powers for the State did not cover the situation, and that individuals had certain fundamental rights which must be protected." Governor Emmerson vetoed the bill and it was sent back to the legislature.

On June 1, 1931, before the bill came up again in the legislature, the *Journal of the American Medical Association* carried a two-page editorial defending the bill. The Legislative Reference Bureau assured the Illinois Society for the Prevention of Blindness that the police power of Illinois was unlimited when loss of life and limb was concerned and that loss of eyesight ranked as equivalent to loss of life and limb. Helen Keller sent an open telegram to the legislature espousing the proposed legislation. Labor leaders wrote letters and lobbied for its passage, but the bill lost by six votes.

Mrs. Gradle did not give up the fight. She immediately began her campaign in prepara-

tion for the next session of the legislature. She went into the 51 legislative districts, organized committees in each district, made 350 speeches. She secured the support of leading obstetricians, who, at their own expense, testified before the Judiciary Committee. Mrs. Gradle kept 3,114 members of her standing committees working.

In January 1933 the bill was again introduced in the Illinois State Legislature. A new governor and a new attorney general were now in office. The bill was passed on April 18, 1933, and became effective on July 1, 1933. Under Illinois law, the enforcement of the provisions of the law became the duty of the State board of health.

A private agency such as the Illinois society has the advantage of "singleness of purpose," and acts as a catalyst. Other State societies for the prevention of blindness immediately began working on preventive legislation, emulating the courage and persistence of the workers in Illinois.

### Constitutionality of Laws

The validity of the law requiring mandatory use of prophylaxis in the eyes of the newborn child and the reporting to the State health department of "inflammation of eyes" has been tested in court many times. In the case of *Medlin v. Bloom*, Massachusetts Supreme Court, 1918 (15), in an action of tort for defendant physician's negligence in caring for eyes of a newborn whereby the child becomes blind—whether defendant failed to treat the child's eyes with nitrate of silver or not after birth, and if not, whether the blindness was due to such omission as the proximate cause of the blindness—it was held to be a question for the jury to decide.

In this action the judge in the lower court instructed the jury, in substance, that "failure of the defendant to report the case ('inflamed eyes') to the State board of health as promptly as he should have done under RL 75 as amended by Statute 1905, chapter 251, section 2, was immaterial and was not to be considered as evidence of negligence." The lower court found for the defendant.

The Supreme Court of Massachusetts held that: "If you find the defendant violated the provisions of the act of 1905, that is evidence of negligence on part of the defendant." The court further held that "the evident purpose of the statute is that the board of health may be informed without delay of the existence of the most serious disease which may affect young children, so that immediate and scientific treatment may be received and blindness prevented. Such failure was evidence of neglect, and the decision of the lower court reversed and remanded."

In the case of *Dietsch v. Mayberry* (16), Ohio Appellate Court, 1942, it was held that the court is bound to take judicial notice of rules and regulations of the State board of health promulgated under statutes relating to investigation and report all cases of inflammation in the eyes of the newborn, under General Code, section 1248-1 to section 1248-5. The court held that the purpose of the statute is two-fold: (a) to benefit the newborn by preventing blindness, and (b) to relieve the public from the burden of supporting another blind child.

The court held that violation of such a statute was "negligence per se." The lower court found for the defendant but the Court of Appeals reversed the decision in favor of the plaintiff. This decision was based on the element of omission by the defendant in his duties to the plaintiff—his failure to notify the State board of health of the inflamed condition of the infant's eyes. This charge of negligence of the defendant had been omitted by the judge in the lower court in his general charges to the jury on negligence of defendant. Verdict was for the plaintiff, and the case was reversed and remanded.

### Treatment

Since the discovery of penicillin, which is highly effective in the treatment of ophthalmia both locally and systemically, it has been shown that local ocular penicillin has prophylactic value. The proponents of silver nitrate prophylaxis opposed its abandonment in the treatment of ophthalmia neonatorum, although they admitted that a 1-percent solution of silver nitrate does cause chemical conjunctivitis

in a high percentage of cases. This condition is not serious, however, and there is no record of silver nitrate prophylaxis, properly performed, causing injury to an infant's eyes. The proponents of penicillin prophylaxis maintain that this antibiotic is equally efficacious in the prevention of ophthalmia neonatorum and has none of the objections leveled against silver nitrate.

The California State Board of Health amended its regulations pertaining to prophylaxis for ophthalmia neonatorum in June 1953 (17). The change provided for use of either 1 percent of silver nitrate in wax ampule or penicillin ointment. They accepted penicillin ointment as the only approved antibiotic preparation and recommended it on the basis of (a) data obtained from controlled clinical studies indicating its effectiveness and (b) ease of administration (18).

### Summary

Ophthalmia neonatorum is a reportable disease and must be reported to the State health department in all States. In spite of the fact that the laws in all States require some prophylactic instillation in the eyes of the newborn child (which should prevent this infection), the disease still occurs. The table gives the number of cases of the disease in States which reported to the National Office of Vital Statistics in the years 1946-52. In 1952, only three States—Mississippi, Tennessee, and South Carolina—reported their ophthalmia neonatorum cases to the National Office of Vital Statistics.

Some form of prophylaxis against ophthalmia neonatorum is required by law or State board of health regulations in all States and in the District of Columbia. Thirty-three States require the use of prophylaxis for the prevention of this disease but leave the choice of prophylactic agent to the physician, the midwife, or the nurse in charge of the infant. All States require reporting of "inflamed eyes" occurring shortly after birth to the local health officer, who in turn must report the case to the State board of health.

Some States have qualified the use of prophylaxis for ophthalmia neonatorum; one State



**Annual morbidity reports of ophthalmia neonatorum, by States, as reported to the National Office of Vital Statistics, 1946-52<sup>1</sup>**

State	1946	1947	1949	1950	1951	1952
Alabama						
Arizona	11	9	4	7	1	
Arkansas	2	5	3	4	5	
California			11	7	8	
Colorado			1		1	
Connecticut	1	1	1	2	2	
Delaware						
District of Columbia						
Florida	18	30	11	22	14	
Georgia				4	2	
Idaho						
Illinois	421		152	128	32	
Indiana	1					
Iowa						
Kansas						
Kentucky			2			
Louisiana	14	3	6	6		
Maine						
Maryland	27	11	7	3		
Massachusetts	122	308	160	167	91	
Michigan	18	12	14	23	19	
Minnesota					1	
Mississippi	32	53	36	35	34	27
Missouri	1					
Montana						
Nebraska						
New Hampshire						
New Jersey	18	6	8	6	6	
New Mexico			8	5	4	
New York	70	53	25	23	26	
North Carolina						
North Dakota						
Ohio	530	533	474	535	420	
Oklahoma	1	5	3			
Oregon			1			
Pennsylvania	17	20	24	8	8	
Rhode Island						
South Carolina	23	28	18	4	2	2
South Dakota						
Tennessee	6	3	12	13	16	7
Texas	105	96	139	75	82	
Utah						
Vermont						
Virginia						
Washington						
West Virginia		7	53	87		
Wisconsin	7	3	4	4		
Wyoming						
Total	1, 445	1, 186	1, 177	1, 168	774	36

<sup>1</sup> No data available for 1948.

NOTE: No reports were received from States for which no figures are given.

requires ". . . if there is any reason to suspect an infection in the eyes of the newborn, then a prophylaxis must be applied." Another State qualifies the law by not requiring treatment for a minor child if the parent is a member of a recognized denomination whose religious convictions are against medical treatment. Another State provides that ". . . any parent shall not be required to employ such a prophylaxis (as required by State statute) if objections are

made in a written statement to physician or midwife in charge of the case.

The reduction of gonorrhea as a cause of blindness from 28 percent in 1908 to 1 percent in 1950 is a feat of preventive medicine of no small proportion. The continued role of gonorrhea in the production of blindness probably is attributable to errors in the method of use of prophylaxis rather than to ineffectiveness of the procedure itself.



## REFERENCES

- (1) Quellmalz, G. S. T.: *Centralbl. f. prakt. Augenh.*, February 1894. Cited by C. C. Norris in *Gonorrhea in women*. Philadelphia, W. B. Saunders Co., 1913, p. 24.
- (2) Goetz, J. G.: *De ophthalmia infantum recens natorum*. Cited by C. C. Norris in *Gonorrhea in women*. Philadelphia, W. B. Saunders Co., 1913, p. 24.
- (3) Gibson, B.: *Edinburgh Med. and Surg. J.*, 1807, p. 160. Cited by C. C. Norris in *Gonorrhea in women*. Philadelphia, W. B. Saunders Co., 1913, p. 24.
- (4) Vetch: *Practical treatise on diseases of the eye*, 1820, p. 242. Cited by C. C. Norris in *Gonorrhea in women*. Philadelphia, W. B. Saunders Co., 1913, p. 30.
- (5) Neisser, A.: *Deutsche med. Wchnschr.*, 1882, vol. xiii, p. 279. Cited by C. C. Norris in *Gonorrhea in women*. Philadelphia, W. B. Saunders Co., 1913, p. 36.
- (6) Hirschberg and Krouse: *Centralbl. f. prakt. Augenh.*, 1881, vol. v, p. 39. Cited by C. C. Norris in *Gonorrhea in women*. Philadelphia, W. B. Saunders Co., 1913, p. 37.
- (7) Posey, W. C.: *The romance in the movement for the prevention of blindness*. *Sight-Saving Rev.* 4: 83-93, June 1934.
- (8) Credé, K. S. F.: *Die Verhütung der Augenentzündung der Neugeborenen*. *Arch. f. Gynaek.*, Berlin. 18: 367-370 (1881).
- (9) Kerby, C. E.: *Blindness in preschool children*. *Sight-Saving Rev.* 24: 15-29, Spring 1954.
- (10) Lehrfeld, L.: *Venereal disease and prevention of blindness*. *Sight-Saving Rev.* 1: 48-54, December 1931.
- (11) Kerby, C. E.: *A plan for standardization of statistics of the blind*. *Sight-Saving Rev.* 5: 4-12, March 1935.
- (12) Wilmer, W. H.: *Ophthalmia neonatorum*. *Proceedings of the Eleventh Annual Conference of the Health Officers and Boards of Health of Maryland*, Baltimore, May 10, 11, 1929. *Bulletin of the Maryland State Department of Health*, vol. 2, No. 1, 1929. Also in *Collected Reprints from the Wilmer Ophthalmological Institute of the Johns Hopkins University and Hospital*, vol. 1, 1925-29, Baltimore, Johns Hopkins University Press.
- (13) *Ophthalmia neonatorum campaign in Pennsylvania*. *Sight-Saving Rev.* 1: 57, June 1931.
- (14) Hayden, A. M.: *Prevention of blindness in Illinois*. *Sight-Saving Rev.* 1: 28-37, December 1931.
- (15) Medlin v. Bloom. *Northeastern Reporter*. 119: 773-775 (1918).
- (16) Dietsch v. Mayberry [May 12, 1942]. *Northeastern Reporter* (2d series) 47: 404-410 (1947).
- (17) California State Department of Public Health: *Memorandum on use of penicillin ointment for the prevention of ophthalmia neonatorum*. San Francisco, The Department, December 3, 1953. Mimeographed.
- (18) Davidson, H. H., Hill, J. H., and Eastman, N. J.: *Penicillin in the prophylaxis of ophthalmia neonatorum*. *J. A. M. A.* 145: 1052, April 7, 1951.

## The Salk Vaccine

The development and successful trial of the Salk vaccine against paralytic poliomyelitis is a major step toward control of a crippling disease. It represents the culmination of a truly historic medical and public health achievement.

This development of a successful vaccine places a great responsibility on the physicians, the public health agencies, and the parents in our Nation. I am confident that physicians and health officials

will conscientiously conserve and put to best use the supply of vaccine. Parents should cooperate with them. As the supply increases, there will be enough for all who wish to be immunized.

Within our time, therefore, we can expect to see effective control of crippling polio. I offer my sincere congratulations to all who have contributed to this great effort to protect future generations from the specter of poliomyelitis.

—LEONARD A. SCHEELE, Surgeon General,  
Public Health Service, April 12, 1955.

# Poliomyelitis Vaccination

The achievement of the new poliomyelitis vaccine is truly a great story deserving the full play it has received in the newspapers. It is one of the great public health events of the mid-century. It represents a triumph of basic research and an amazing example of effective teamwork.

The details of the evaluation of the 1954 field trial of the Salk vaccine, reported at the University of Michigan, April 12, have been adequately covered by the press. So I thought it would be more interesting to trace some of the scientific problems that had to be solved in the course of achieving a poliomyelitis vaccine and to attempt to outline some of the future developments and problems.

Until quite recently no coherent theory of the disease was established. The scientific basis for an effective means of immunization or control did not exist. Many facts were known, but they were separate pieces of a jigsaw puzzle that did not seem to fit together. For example, early epidemiological studies 50 years ago led to the inference that there were 100 persons infected for each one paralysed, but it was not until 1940 and later that this thesis was proved in the laboratory. The age distribution of cases, resembling that of measles, led to the inference that immunity followed an attack, but there were disconcerting numbers of bona fide instances of double attacks of the paralytic form of the disease. This cast doubt on the immunity mechanism.

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*Presented is a summary of Dr. Alexander D. Langmuir's informal remarks before the meeting of the Departmental Council of the Department of Health, Education, and Welfare, April 14, 1955. Dr. Langmuir is chief of the Epidemiology Branch, Communicable Disease Center, Public Health Service.*

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For many years it was believed that the virus had a peculiar predilection for nerve tissues. This belief led to the study of nasal sprays in an attempt to "block" the supposed pathway to the brain along the olfactory nerve. The treatment caused a lot of people temporarily to lose their sense of smell but did not prevent poliomyelitis.

Careful search for the virus in the blood failed to reveal its presence there with sufficient consistency to support the conclusion that blood was the mechanism for transfer of the virus to the brain.

In the laboratory for more than 30 years, the only animal susceptible to the infection was the monkey. In 1939, Dr. Charles A. Armstrong of the Public Health Service announced the isolation of the Lansing strain in mice, but this culture turned out to have so many peculiarities that some persons doubted for a time that it was truly a poliomyelitis virus. Tests for immunity to poliomyelitis viruses were very difficult, expensive, and often so inconsistent as to result in continued confusion.

In the field, epidemiological studies also left many points uncertain. The isolation of the virus from feces led many workers to think of the disease as comparable to typhoid. Later, the discovery of the virus in flies led to extensive attempts to control epidemics with DDT. The exact route of infection from one person to another remains in doubt, but increasing evidence points to the similarity of this infection to the other classical contagious diseases such as measles, chickenpox, and mumps.

In the solution of these problems, certain major "breaks" in the form of new discoveries and contributions to basic knowledge deserve special mention.

In 1948, Drs. Howard A. Howe, David Bodian, and Isabel M. Morgan, at Johns Hopkins University, were able to define the immu-

nity mechanisms in poliomyelitis by using large numbers of monkeys almost to the degree that other laboratories might use mice or guinea pigs. The availability of such numbers of monkeys was, of course, one of the brilliant contributions of the National Foundation for Infantile Paralysis. It was shown that three distinct types of poliomyelitis existed, each separate from the other. One of these types was the Lansing strain isolated by Dr. Armstrong. The existence of these three types adequately accounted for the occurrence of double attacks of the disease. A comparable experience is that one can catch German measles independently of true measles. The discovery of the three types of poliomyelitis and the existence of an immune mechanism similar to other diseases strongly suggested the possibility of a vaccine and indicated that all three types of virus would have to be included in it.

In 1949, Dr. John Enders at Harvard University announced the cultivation of the poliomyelitis virus in human tissue cultures. Later it was possible to grow the viruses abundantly in monkey tissues. This discovery made possible the production of the large quantities of virus, free of undesirable brain tissue, that would be necessary for a national supply of vaccine.

In 1951, when many workers were still thinking of poliomyelitis as primarily a disease of nerve tissues, Dr. David Bodian at Johns Hopkins and Dr. Dorothy M. Horstmann at Yale University simultaneously announced the discovery of the virus in the blood stream of monkeys and later of man. The key to this fundamental discovery was looking for the virus at the right time, namely, before symptoms developed rather than after the disease was in full swing. This discovery further gave promise of the probable effectiveness of a poliomyelitis vaccine because immunity in the blood would eliminate virus and probably prevent it reaching the nervous system.

In 1952, Dr. William Hammon at the University of Pittsburgh reported his successful studies of gamma globulin. These further supported the concept that a vaccine would be successful.

Thus, only in the last 3 to 4 years has a coherent theory of the disease been developed and

have the technological tools become available to permit in humans large-scale tests of vaccination against poliomyelitis.

In developing the actual vaccine, Dr. Jonas E. Salk of the University of Pittsburgh has been the extremely able executor of all this basic scientific development over many years in many laboratories. As he most aptly stated recently, "Dr. Enders threw a forward pass and I happened to catch it." He is an accomplished runner.

The Public Health Service is proud to have had the opportunity of participating in the vaccine evaluation by assigning Epidemic Intelligence Service officers to Dr. Thomas Francis' laboratory and to the collaborating States and research laboratories. They have been some of the soldiers on the team—doing much of the legwork in collecting basic records and specimens. They have contributed considerably to the accuracy and completeness of the data and thereby to the confidence in the conclusions that have been reported.

The Biologics Control Laboratory of the National Microbiological Institute, National Institutes of Health, worked closely with Dr. Salk and the participating pharmaceutical houses in developing standards for the vaccine. This laboratory, along with the NIH Rocky Mountain Laboratory at Hamilton, Mont., and the Virus Laboratory of the Communicable Disease Center, located in Montgomery, Ala., also participated in the vaccine evaluation.

I expect widespread acceptance of the vaccine this year. A rapid decline in the disease can be looked for. As yet it cannot be concluded whether the virus will disappear from the Nation or whether the infection will continue to spread among the population without causing paralysis in immune persons. If the infection progressively disappears, as I believe it will, then it will be necessary to immunize only a substantial number but not all susceptible persons in the population. If the virus continues to spread, then it will be necessary to exert particular effort to immunize 100 percent of the population, including adults. In either event, the supply of vaccine should become sufficient and the essential elimination of the paralytic form of the disease can be predicted with assurance.

# Medical Librarianship

By ESTELLE BRODMAN, Ph.D.

JUST as there were nurses long before the profession of nursing came into formal being, so there were medical librarians before there was a profession of medical librarianship. As late as 1853, a meeting of American librarians in Philadelphia was attended not by librarians as such, but by clergymen, educators, some lawyers, and a few physicians, all of whom acted as librarians as well. Indeed, it might be said that librarianship as a profession did not begin to take shape until after the American Civil War, and medical librarianship, as differentiated from general librarianship, not until about the turn of the 20th century. Even then, when the Medical Library Association was founded, there were more physicians acting as librarians than there were professional librarians.

Today, medical libraries and medical librarians serve public health workers daily all over the country, especially by bringing them up-to-date information on the professional problems with which they are faced and by showing them how others have solved similar problems. Since medical libraries are one of the modern tools of the public health worker, a knowledge of their development and present status should be of interest.

In order to understand the late development

of medical librarianship, it is necessary to consider the conditions prevailing before the mid-19th century. For a profession to develop, there must be a large body of information available, a need for specialized techniques in handling the information, and a substantial number of people who need the information but do not have the time or inclination or ability for acquiring the specialized techniques.

## Growth of Medical Literature

The first requirement for the development of medical librarianship was the existence of a large body of medical information. Medical literature has been accumulating for many centuries. Perhaps the earliest nonmagical medical works that have come down to us are the Egyptian papyri, the Papyrus Ebers and the Papyrus Edwin Smith, named after their modern discoverers but actually written about the 16th century B. C. from even earlier texts. The Papyrus Ebers is a medical treatise and the Papyrus Edwin Smith a surgical work (1), but both give such clear and accurate clinical descriptions as to leave no doubt of the high state of medicine at that time.

These papyri are not isolated examples of medical writings. There are copies of Indian medical works from the 7th to the 5th centuries B. C., the Susruta, the Atreya, and the Vagbhata, the first of which can be compared to the Papyrus Edwin Smith for its surgical cases and to modern works for scientific reasoning about such things as the relationship of mosquitoes to malaria and dead rats to plague.

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Chinese medicine also produced literature of a fairly high order somewhere between the 3d and 10th centuries B. C., and the writings of such Greek and Roman physicians as Hippocrates, Galen, and Celsus are known to all who have contact with medicine. Even during the so-called dark ages of Europe, medical literature was prepared, laboriously copied by hand, and circulated to interested persons, as shown by the books which we possess from that period: the writings of Constantinus Africanus, Roger of Palermo, Roland of Parma, Henri de Mondeville, and Guy de Chauliac, and the *Regimen Sanitatis Salernitanum*, among others.

### Indexes to Medical Literature

With the invention of the printing press in the mid-15th century, the ability to reproduce books cheaply in large quantities led to an increase in the available literature in all fields, including medicine. It is a truism that physicians read medical literature primarily to learn what others have done in similar situations; it follows from this that the physician must be able to learn of the existence of writings bearing on his problem. As the printing press increased the medical works available to him, the physician found it increasingly difficult to learn about the existence of pertinent published information and to acquire it when aware of it.

As early as 1506, a new form of medical writing appeared, the list or bibliography of previous publications (2), to which the physician could refer when he wished to learn what had been written on a particular subject or by a particular person. The earliest printed medical bibliography, the *De Medicine Claris Scriptoribus* of Symphorien Champier, was followed by numerous other such lists, growing in size as the literature grew, and splitting into subdivisions by subject or by period of time, as the growing bulk of medical writings demanded.

Further intensifying the growth of medical literature was the emergence of the magazine or journal, which contained a number of contributions in each issue and which was meant to be continued indefinitely. The first medical magazine (periodical) was probably the *Acta medica* published in Copenhagen in the 17th century by the great Danish anatomist and physician,

Thomas Bartholin. The first medical journal printed in the vernacular was probably Nicolas de Blegny's *Nouvelles découvertes sur toutes les parties de la médecine*, begun in Paris in 1679. From these and from the pages of the transactions of the many learned societies which included medicine among the other sciences came such an increase in the literature that readers were swamped. It is estimated that today approximately 7,000 to 8,000 medical serials are published throughout the world.

The amount of medical literature available caused Wilhelm Gottfried Ploucquet, the German medicolegal expert and bibliographer, to complain bitterly of excess as early as 1808. "The job would be simpler," he said, "if the legacy were smaller, but the wealth of material overwhelms us, and we are blinded by too much light . . . To make matters worse, no day passes but someone throws another article on this mountain of material . . . Our life is too short, and there are so many books; money is so scarce, and there is so little time."

### Specialized Techniques

The output of literature during the last few years of the 18th century began to be overwhelming, and the acceleration caused by the scientific discoveries of the mid- and late-19th century made a new approach to the problem imperative. In the 1860's, under the prodding of Joseph Henry, the first secretary of the Smithsonian Institution in Washington, D. C., the Royal Society of London began the collection and indexing of scientific literature, using groups of workers who were guided by a special committee of the society's members. The Royal Society Catalogue may be said to be the first large-scale joint venture into cooperative bibliography, and was a realistic attempt to meet a changed situation by adopting new methods to solve the problem. It has become the prototype of most of the bibliographic work done in the sciences since then. The most famous medical examples of this method are, of course, the *Index-Catalogue of the Library of the Surgeon-General's Office*, the *Quarterly Cumulative Index Medicus*, and the *Current List of Medical Literature*. Science bibliographers are now attempting to find still another

solution to the problem by the use of machines and newly developed storage devices.

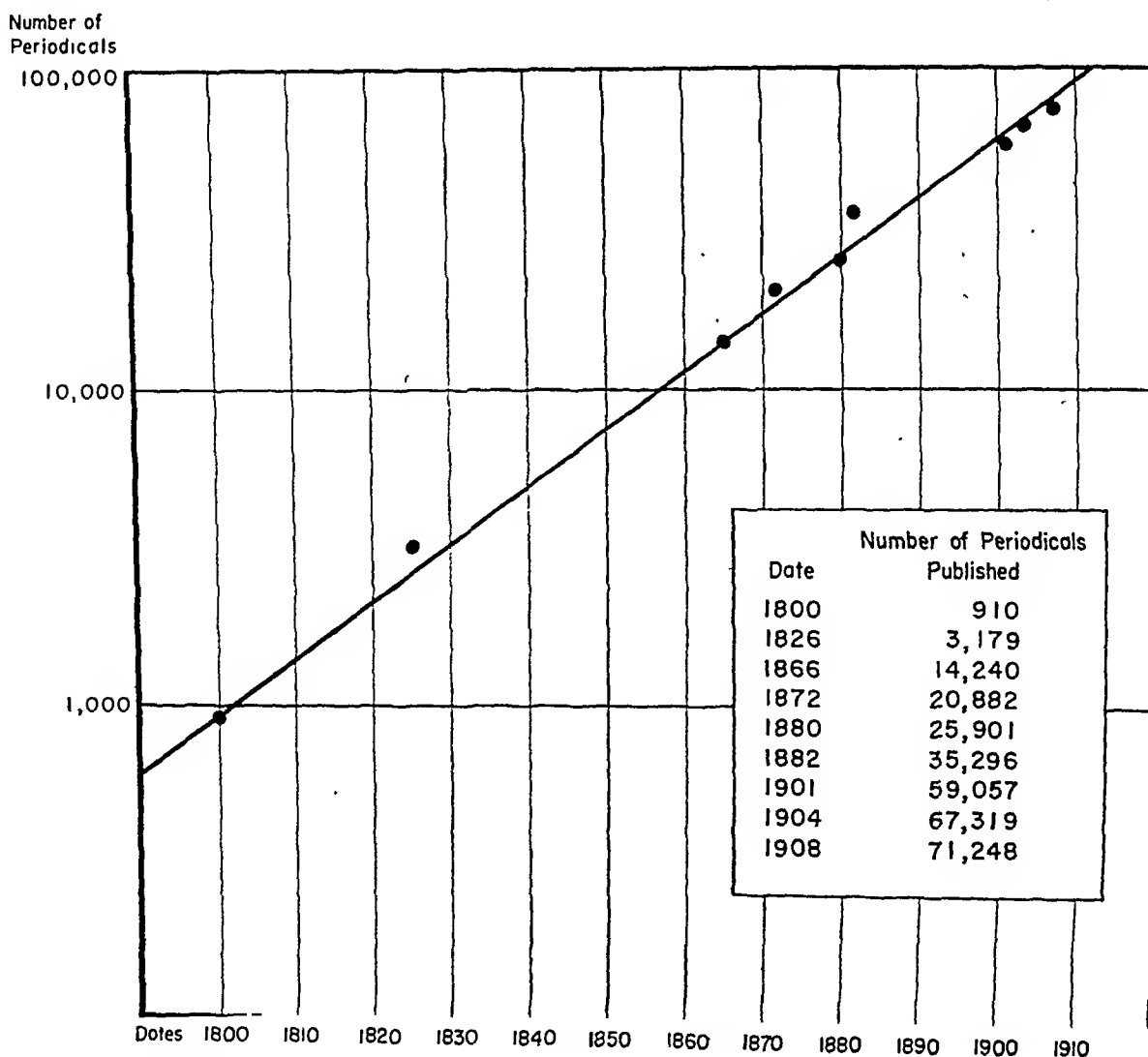
This method of indexing the literature—bringing together a number of people to work jointly on a body of data—provided the second prerequisite for the growth of medical librarianship, specialized techniques. By the third quarter of the 19th century, medical literature had grown to such proportions that specialized techniques for handling it had to be devised. These techniques, in turn, required so much time to master and practice that physicians were unable to continue their previous work in the field. In addition, the amount of literature, which had made it more and more difficult for the private practitioner to afford to acquire or

house a medical library, had caused the proliferation of “public” medical libraries. Thus, the profession of medical librarianship began to come into being in the 1880’s and 1890’s and was so strong by 1898 that a Medical Library Association could be founded in that year.

### Education for Medical Librarians

The development of medical libraries paralleled that of libraries in other fields. The American Library Association was founded in 1876, and the first school of librarianship started in 1887 at Columbia University in New York City. Eleven years later there were enough people engaged in the field of medical libraries to

Growth of periodical literature, 1800–1908.



make possible the organization of an association of medical librarians, and soon thereafter education for medical librarianship was discussed.

As the number of people engaged in library work grew, apprentice classes were held in large libraries and theoretical courses were given in colleges and universities to provide specialized education for librarians. Within these schools, a trend toward more courses, more hours of attendance, and more theoretical discussions gradually appeared. This trend was aided by the depression of the 1930's; since it was difficult to obtain jobs, more people were willing to lengthen their stay in school.

In the late 1920's and early 1930's, it began to be realized that not every kind of librarianship was exactly the same as every other kind. At first this led to library school classes based upon the group served by the library—college and university libraries, public libraries, or children's libraries. Later, the subject material handled became the criterion, and from a somewhat undifferentiated course on special libraries there sprang up courses on law librarianship, music librarianship, and medical librarianship. That this fractionation is likely to continue is shown by the fact that the Joint Committee on Library Education, set up by various American library associations, is investigating possible curriculums in still other portions of library work, such as journalism. On the other hand, a feeling has also arisen that there is indeed a core of study to which it would be well for all librarians to be exposed. In the late 1940's, many library schools in America revised their courses (and at the same time their scheme of degrees) to include the same core curriculum for all students. In the present setup, medical librarianship continues to be taught as an adjunct to the core curriculum.

Formal courses in medical librarianship began in the United States in 1937 and have continued to this time, thanks in part to the fact that this country was not disrupted by World War II as soon or as deeply as European countries. There have also been several attempts at education for medical librarians in other countries (3,4).

Since training in medical librarianship is a universal problem, the United Nations, through

its specialized agencies, the United Nations Educational, Scientific and Cultural Organization and the World Health Organization, has concerned itself with it. Workshops and courses for European medical librarians have been held or planned; traveling fellowships have been arranged to enable medical librarians from economically backward countries to visit medical libraries in other places; and the World Health Organization in the 1950's appointed the former head of its own library to visit medical libraries throughout Europe and give suggestions and whatever other aid was needed.

### Medical Library Services

Since the training of medical librarians is based on the services they are expected to provide, it is profitable to consider what medical libraries offer. Public health workers are recipients of all these services. The most important part of any medical library is its collection; with a well-chosen stock of books, journals, and bibliographical indexes, the library will be of use to anyone truly seeking its information. The selection of materials is, therefore, a primary concern of the medical librarian, and the smaller the budget the more carefully must the selection be made. Once the collection has been brought together, the next step is preparing it for use by such devices as catalogs, classification systems, book markings, proper shelving, and the like. And, finally, the medical librarian helps the user through his knowledge of what is in his own collection and through his ability to obtain other material from outside collections. Occasionally, the librarian will make abstracts, reviews, or bibliographies for readers, though this is not common practice, and sometimes he will arrange for translations.

To prepare to perform these services, the medical librarian is ordinarily trained academically in colleges and schools of librarianship and by on-the-job internships. At present, there are more than 35 schools of librarianship in the United States which require a college degree for entrance. Students expecting to work in medical libraries usually present some academic scientific background before entering library school, though unfortunately not as many have this training as are needed. An-



other prerequisite for good work in a medical library is a knowledge of foreign languages, for, although it may be true that at present a large portion of medical research is reported in English, there is still a sizable amount in other languages. And the past literature, on which the present is based, contains perhaps 80 to 90 percent foreign material. The more German, French, Italian, or Russian a medical librarian can understand, therefore, the more valuable he will be.

The Medical Library Association has set up a voluntary certification program for medical librarians, which calls for college and library school training, with a special course in medical bibliography and librarianship, a course now given at three universities in the United States—at Columbia University in New York City, at Emory University in Emory University, Ga., and at the University of Southern California in Los Angeles. Scholarships are provided by the association to aid people taking these courses.

### Present Status

Salaries offered medical librarians today generally start at around \$3,000 a year and tend to go up to about \$6,000, though heads of large medical libraries may receive as much as \$9,000–\$12,000. Since many medical libraries are connected with teaching institutions, the working conditions, vacations, pensions, and privileges tend to approach university standards. Normally about 60 new medical librarians can be absorbed each year, but the annual production of these specialized workers ranges around 30 a year. As a result, many nonspecialized librarians find their way into medical library work.

The number of medical libraries now in existence in the United States is not definitely known, but some 600 are members of the Medical Library Association, a professional organization international in scope but predominantly American in character. These include libraries in hospitals, medical schools, medical societies, nursing and dental schools, pharmaceutical libraries, psychiatric libraries, and at least eight libraries in departments of health. For membership in the association, a library

must maintain a collection of 1,000 or more medical and allied books of which at least 500 must have been published in the preceding 10 years; receive regularly a minimum of 25 journal titles appropriate to the institution; and have regular hours of opening and a regular attendant in charge.

The American Medical Association (5) and the American College of Surgeons (6) have also promulgated standards for libraries in the field of medicine; and the American Dental Association (7) and the National League of Nursing Education (8), for libraries in their fields, especially in hospitals approved by them for the training of interns and residents. The American Medical Association, the American College of Surgeons (9), the National League of Nursing Education (10, 11), and the Veterans Administration (12) have even gone so far as to publish lists of books and journals useful to such libraries, and the American College of Surgeons has even included hints on the administration of the collection (13). In the military field, the Office of the Surgeon General, United States Army, has long had a board for the review of medical books and journals, and it regularly publishes lists of officially "approved" books (14).

Although many guides and minimum standards have been established, the actual state of medical libraries in the United States varies enormously. Collections range from a few hundred out-of-date volumes and broken runs of journals to such mammoth libraries as the Armed Forces Medical Library, with its stock of close to 1 million titles, its receipt of over 4,000 periodicals, and its staff of over 200 people. The large majority of American medical libraries contain between 20,000 and 40,000 volumes, receive about 200 magazines regularly, spend approximately \$800 annually for other purchases, and have one or two professional librarians and a clerical worker on their staffs.

### Future of Medical Librarianship

The major problems of medical librarianship today are these: (a) how to acquire, store, and make available the constantly enlarging body of literature being produced; (b) how to recruit and keep librarians trained in sciences,



child's life were also contributing positively to his better adjustment.

The Junior League again had first-hand contact with the field of mental health in 1948, when it was proposed that the group provide funds for psychiatric social work in a day care center. Such service, it was thought, could accomplish much for the children and their parents and might be extended to other local day care centers.

Investigation indicated, however, that the financial burden of the proposed project would be too heavy and that the community had more need for consolidation of services than for expansion of services. So the search continued for some feasible method of supplying psychiatric services in Holyoke.

In the winter of 1949-50, the league investigated possible new projects for which its children's fund could be used. Among the possibilities suggested was that of a mental health clinic for children, to be established in the local schools, and to be financed with State and local school funds. It was proposed that the league lay the foundation for getting the clinic under way and perhaps supply it with some financial and volunteer assistance when it was established. But it soon became clear that this project would require far more than league sponsorship.

In investigating the community's resources during this period, contact was made with the community organization expert of the Massachusetts State Department of Mental Health. His interest was to be of enduring usefulness since he not only met with the league members who were searching out possible projects, but he remained in constant touch with the group and was invaluable in encouraging and finally bringing the developing clinic to a successful culmination.

Together, the professional organization expert, the superintendent and assistant superintendent of the Holyoke schools, and the executive secretary of the Holyoke Community Council formed a small planning committee.

In line with the State mental health department's philosophy that "each community health program should serve an area with a population between 100,000 and 200,000," it was proposed

that the plan for the mental health clinic be extended beyond Holyoke to include Chicopee, Easthampton, Northampton, and South Hadley, Mass.

The Holyoke group was willing to accept this expansion of its original concept and to modify its plans from those of a local center to an area center. Representatives of the proposed area were invited to subsequent meetings of the planning committee. The pressing need for a clinic was voiced by all members of this new steering committee, which by now represented the fields of medicine, education, and social welfare.

Further exploration into the need for the clinic was then undertaken. Questionnaires were sent to physicians, schools, children's agencies, veterans groups, departments of public welfare, boards of health, and nursing associations. The replies pointed up the need for inservice training courses for professional personnel and for high quality in diagnosis and treatment.

Believing it worth while to explore the area's need even still more carefully, the steering committee met with top educators and local medical societies. Members of public and private social agencies, the city solicitor, and representatives of the probation department, women's clubs, and the clergy were present at one large meeting. Other meetings sought, in order to reach such groups as industry and the courts and labor organizations, to study the legal and economic aspects of the proposed mental health service. Various individuals brought to the meetings their point of view of the need and value to the community of enlightened psychiatric services.

### **A Major Setback**

After these numerous meetings, formal application was made for Federal grant-in-aid. Unfortunately, owing to the demands of the Korean action, the application was not acted upon favorably, but encouragement was held out for the future.

It is evidence of the strength of the structure erected by the steering committee that this setback in its carefully documented plan did not cause it to disintegrate or to turn to other, less

frustrating projects. It is evidence, too, of the wisdom of bringing into the planning representatives of many fields whose practical needs now encouraged the league to sustain its interest in spite of the serious reverse.

The Holyoke Junior League showed some interest in reverting to the original plan of providing a service for Holyoke alone, and there was some exploration of the possibility of organizing a small clinic as part of the Holyoke Hospital's outpatient service. But these suggestions only served to strengthen the conclusion that a clinic must spread its influence into the community and that there was need among the community's professional workers for psychiatric consultation. It was believed that a very small clinic with its necessarily limited caseload would not have enough effect on the community if the only contact of the staff with the community were a direct one with the patients.

In the year 1951-52, when the prospects for the original plan to establish mental health services for Holyoke seemed to be even more obscure than ever, much progress was actually being made.

It might even be postulated that the long period of preparation for the clinic and the unwavering interest in realization of the project, in spite of the many setbacks, were major factors in assuring ultimate success.

Increasingly, the continuing members of the steering committee, meeting informally, came to see their project in much the same light as the whole problem of mental health service was being appraised nationally—not as the establishment of a treatment clinic alone, but as a focus for mental health activity through an entire area.

They began to think in terms not only of providing psychiatric outpatient care for the many individuals in the community who were in need of such help but of a long-range and fluid program for improving the mental health of the whole area.

#### **Help From the State**

The State department of mental health, in making its survey of the services then available in the State in order to determine the

direction of its own future growth, based its thinking on a philosophy of prevention of mental ills. In planning for new clinical facilities, the department considered as a prime requisite the readiness of the community to accept such concepts.

The department expressed the philosophy of its mental health program in the *Mental Health News Letter* of the Massachusetts Association for Mental Health (June-July 1953):

"The State will join with any responsible and representative community group to work towards bringing to the community a mental health and psychiatric clinic program. By responsible we mean that the community group must be dedicated to the continuing job of mental health promotion in the community. It must be able to provide funds on an annual basis from an annual drive, community chest, or other sources. It must be able to write checks, employ personnel, and provide quarters, equipment, and supplies. It has to take a very active part in mental health education, interpreting the function of the mental health program to the community. Furthermore, it must interpret community needs to the professional staff and help it in formulating policies concerning the overall operation of the mental health program."

The department of mental health recognized that although the steering committee had no formal organization it met the requirement of being a responsible and representative group. Consequently, when its survey corroborated the need for psychiatric services in the Holyoke area, the department chose to place a new community clinic there.

Notice came to the steering committee in September 1952 that funds would be immediately available from the department for the establishment of professional psychiatric services.

The committee called a number of meetings to form an association which would assist the State department of mental health by providing clinic space, secretarial service, and maintenance funds. The department made it clear that it would cooperate, as closely as consistent with good professional practice, in carrying out the policies of the association as they represented community needs.

All of the areas that had shown an interest in the formation of the original clinic were now organized under the name of the Mental Health Association of Holyoke, Chicopee and Northampton Area, Inc. A constitution and bylaws were adopted; a board of directors and officers were elected; and application for incorporation was made.

An advisory committee, representative of all the communities and of medicine, education, nursing, social welfare, and the clergy, was formed. One of its early functions was the determination of admission and fee policies. Later, it made known to the clinic some of the problems of local physicians and attempted to find some solutions. This committee has continued to meet, advising on community needs and attitudes.

One of the first responsibilities faced by the board of directors was the raising of funds to cover rent and secretarial and general office expense, and to purchase office equipment. The estimated association budget for the first 18 months of operation was \$10,000; professional salaries were met by the State.

With these funds in hand, it was possible to secure sufficient personnel to provide some professional service by November 15, 1952. The clinic opened as a community health service on February 8, 1953. Treatment was offered for children and their families; consultation was available to physicians and other professional groups in the area; and a program of mental health education was begun.

From the start, the clinic was open 5 days a week, 8½ hours a day, from 8:45 a. m. to 5:15 p. m. The staff consisted of a full-time psychiatrist, a psychologist, a psychiatric social worker, and a secretary.

In July 1954, when a need for the expansion of services was already being demonstrated, the association asked the State department of mental health for more staff. At the same time, it agreed to provide the additional office space and secretarial help. The department was able to provide a clinical psychologist for the newly created departmental position of mental health consultant. His main function was to work with the schools of the area. When it appeared that the department could not provide the part-

time social worker the association had also requested, the association itself took on this responsibility.

At first, housing the clinic was a serious problem, for the clinic operated in rooms donated by the school department, in the beginning in the basement of a school, then in the empty classrooms of an abandoned schoolhouse. Rooms were eventually found in a centrally located office building, and additional space was leased as the clinic's needs increased. In its present location, the clinic is accessible to the whole area it serves; it is no more than a half hour away from any part of the communities.

Each participating community was given an estimate of its share in the budget, arrived at through a rough estimate of population, and was asked to raise the amount in its own way. Care was taken that the association representatives in the communities thoroughly understood the clinic functions, and in the consequent appeal letters and newspaper stories used for money-raising purposes the interpretation of the clinic's work was emphasized.

The success of the funds-raising project varied in the communities although the sum needed was collected. In attempting an informal analysis of reasons for this variation, some felt that one difficulty arose because the incorporation of the clinic was not completed before the drive began. If this had been foreseen, the incorporation papers could have been obtained in an earlier planning phase.

### **The Clinic in Operation**

The present staff consists of a full-time psychiatrist, who is the director of the clinic, a psychologist, the mental health consultant, a full-time head psychiatric social worker, a part-time social worker, and two secretaries, one full-time and one part-time. It is believed that this staff will serve to meet the clinic's needs for the next few years and that the same pattern of a joint undertaking between the association and the department of mental health will continue to apply when further expansion becomes necessary. The present annual budget of the association is \$9,950, and that of the State department of mental health is \$19,900.

No exact formula for dividing the financial responsibility is in existence, nor is this envisaged. Rather, the concept of responsibility is one of joint planning and participation within the capabilities of the State group and the local group.

The communities plan to raise their share of the association funds through the community chest or as part of the school budget and public health funds. There is still some individual solicitation, but it is planned to have this kept at a minimum in the future with the stress on community support of a community agency whose presence is of value both directly and indirectly. Plans are being worked out for social agencies to pay for the consultant services available, and some are already doing so on a retainer rather than on an hourly fee basis.

The clinic accepts for treatment children between the ages of 2 and 18. While no formal

statement is made as to eligibility, it is understood by the staff that there must be some selection of cases in order to function at all adequately. Therefore, the emphasis in selection is on the type of emotional disturbance which can be expected to improve with intensive (weekly) treatment over 6 months to 1 year.

Since the philosophy of the clinic is based on the premise that part of clinical responsibility lies in the field of prevention, consultation work is done regularly or on a request basis with teachers, social agency personnel, the courts, and the clergy.

The acceptance and widening use of the consultation service would indicate that this is an additional service toward meeting the demands of the community and helping those who work with children to understand them better and to improve the mental health climate for all children in the entire area.



## The Dug Well— Sanitary Aspects

35 mm. filmstrip, sound, color, 10 minutes, 72 frames. 1954.

Audience: Sanitary engineers, sanitarians, public health inspectors, and others interested in water supplies.

Available: Loan—Public Health Service, Communicable Disease Center, 50 7th St., NE., Atlanta 5, Ga. Purchase—United World Films, Inc., 1445 Park Ave., New York 29, N. Y.

Public health aspects of dug wells are portrayed in this filmstrip. Em-

phasis is placed on site selection for a well and on construction principles, methods, and materials to be used to best advantage for the location. Types of pumps are demonstrated and the proper installation of each explained. Water sampling and disinfecting techniques are included in the study.

## A Large Water Treatment Plant

35 mm. filmstrip, sound, color, 12 minutes, 84 frames. 1954.

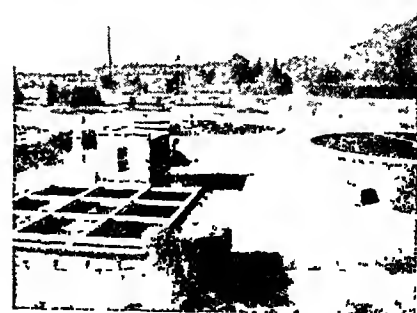
Audience: Sanitarians, sanitary engineers and trainees, and others interested in modern water treatment plants.

Available: Loan—Public Health Service, Communicable Disease Center, 50 7th St., NE., Atlanta 5, Ga. Purchase—United World Films, Inc., 1445 Park Ave., New York 29, N. Y.

Designed to be shown in lieu of making a field trip or to supplement a field trip, the filmstrip shows the equipment of a large modern water treatment plant. It takes the viewer through the plant, beginning with the raw water and intake facilities and structures and following through the chemical treatment, coagulation and settling processes, and the filtering

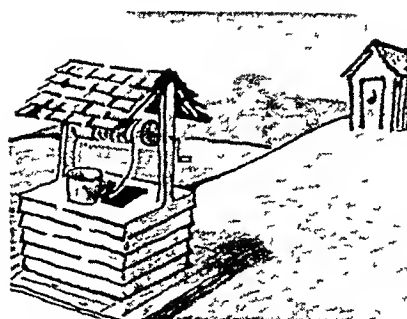


Adjusting a chlorinator.



Panoramic view of a trickling filter plant.

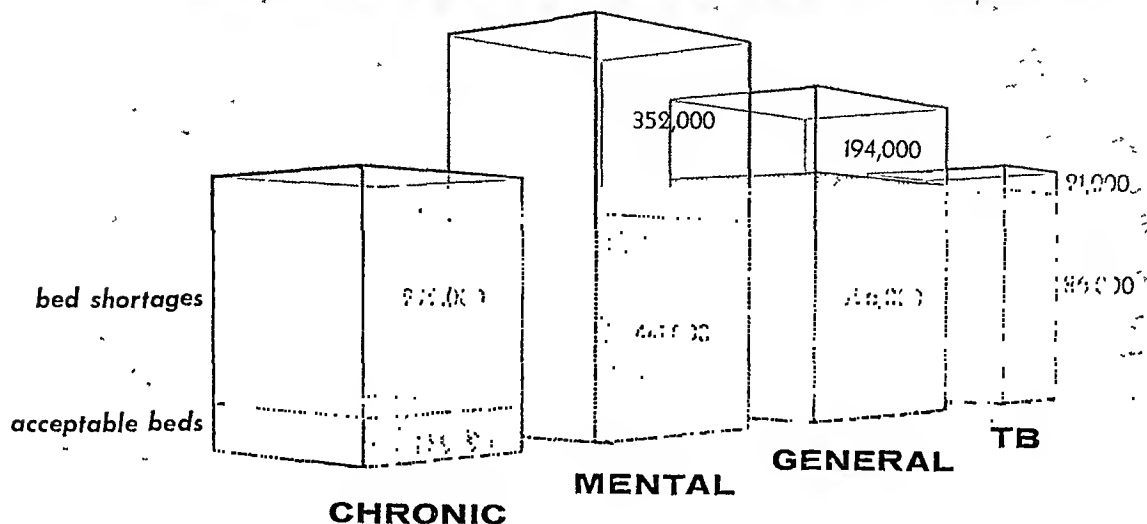
and chlorinating operations. The corrosion control equipment is also pictured.



Pit privy is source of pollution to dug well.

# Hospital Beds

## in the United States, 1955



By LESLIE MORGAN ABBE, B.S.

THE COMPREHENSIVE, long-range plans for hospital facilities developed in connection with Title VI of the Public Health Service Act are revised annually. This continuing responsibility of the official State hospital planning agencies has come, with ripening experience, to provide an authoritative sourcebook on the Nation's hospital resources. Both total capacities and highlights of operating data are recorded in these annual tabulations. By "capacity" is meant that capacity

for which the hospital was planned, rather than a fluctuating bed count, which may reflect either a serious overcrowding or a closed wing. Also, beds which are unacceptable because of functional or physical hazards are listed separately from the acceptable capacity.

Table 1 shows on this basis the record of existing hospital beds in each State and Territory as of January 1, 1955, according to the four principal categories of service provided: general, mental, chronic, and tuberculosis. States are grouped, for convenience of comparison, by the broad socioeconomic regions of the United States.

We now have approximately 1,100,000 acceptable beds in all four categories, with 176,000 additional beds which were classified by the

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*Mr. Abbe is assistant chief of the Program Evaluation and Reports Branch, Division of Hospital Facilities. Public Health Service.*

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This current inventory and continuation report brings up to date the general review of hospital bed requirements in the United States, published in *Public Health Reports*, April 1953, p. 425. It also outlines the present situation in other types of medical facilities and pending efforts for their expansion. The report is limited to hospital bed needs and related accomplishments in that field, including the Hospital Survey and Construction (Hill-Burton) Program. It does not cover nursing home beds and other fields of accomplishment such as the construction of public health centers, State health laboratories, and related health facilities.

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State agencies as nonacceptable for long-range use. Nearly one-half of these acceptable beds, 526,000, are in general hospitals, and mental hospitals have 40 percent of the total. The record of nonacceptable beds is undergoing continual change, as closer inspections identify other obsolete and hazardous conditions. New construction, on the other hand, is replacing and removing from the record a considerable number of such outmoded facilities.

The data in table 1 do not include beds for civilians in Federal hospitals. In general, these do not provide communitywide service available to the general public. According to recent reports, there are 117,000 such beds in operation in veterans hospitals and about 8,000 more in hospitals operated by the Public Health Service for merchant seamen and others, including some Indian facilities.

### What Has Happened Lately

During World War II, hospital construction was virtually at a standstill. After 1946, accumulated reserves of public and private funds were applied to meet long-deferred needs. The encouragement of Federal assistance under the Federal Hospital Survey and Construction Act of 1946 combined to establish an unprecedented peak in hospital construction volume.

Figure 1 shows the history of hospital construction from 1920 to date, at constant prices, and in relation to a growing population. This chart indicates that the postwar peak volume of construction in 1950 amounted to \$5.00 per capita as compared with \$1.00 per capita, or less, during 1942-44 and as compared with a previous high point in 1929 of about \$3.50 per capita, at constant prices. If the volume of

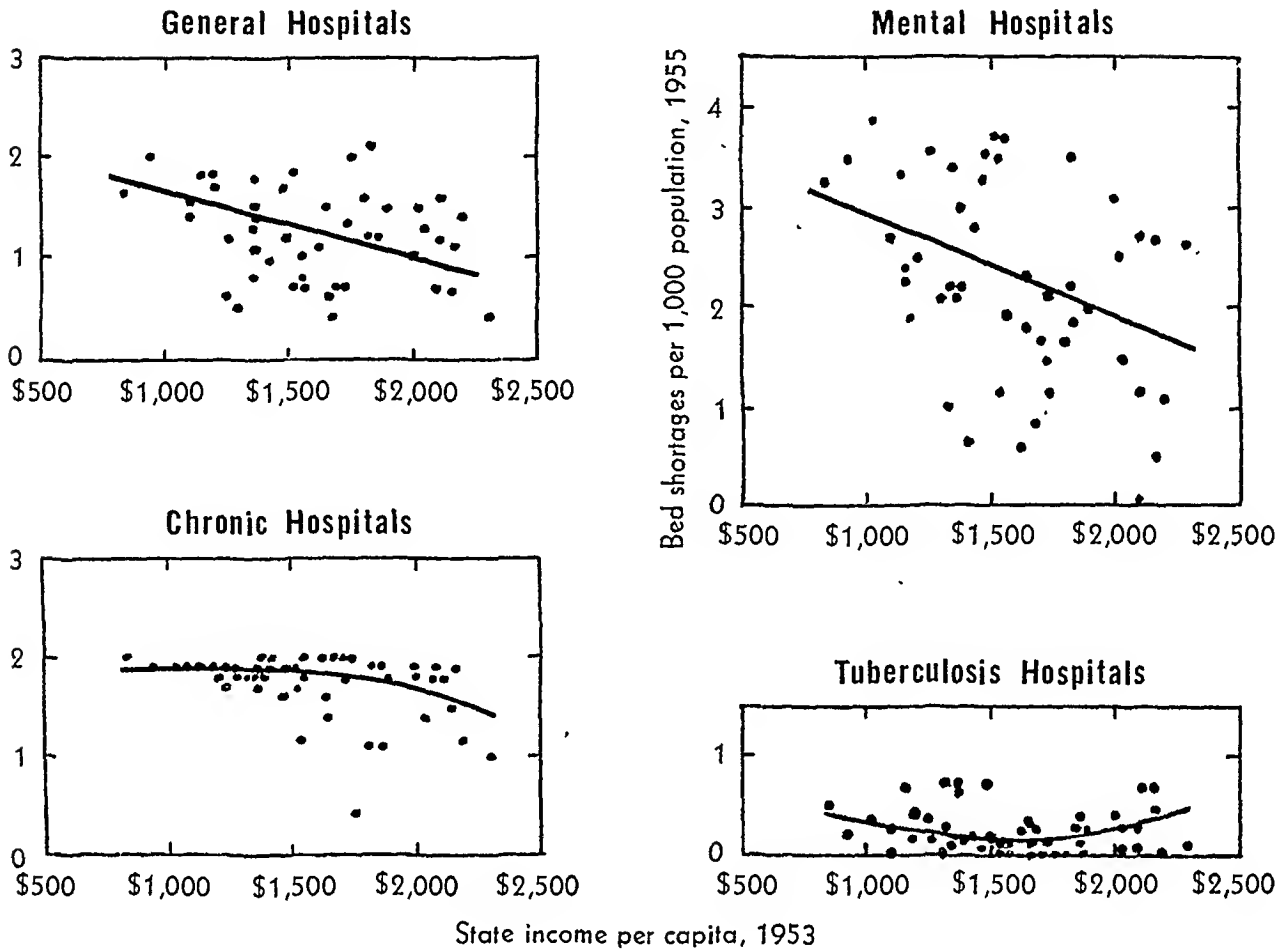
direct Federal construction and federally aided construction is excluded, the remainder undertaken entirely by State and local resources is somewhat less than the 1929 volume per capita—or less than \$3.00. It will be seen that relative volume has declined sharply from the postwar peak.

Studies on the regional distribution of the recent volume of hospital construction (1) show that the largest total activity per capita is occurring in the high-income census regions of the Nation. Federally aided construction accounts for nearly all new work in the regions of lowest income, while in the region of highest income federally aided construction is a minor portion of total construction activity.

The annual log of the State hospital plans, from its beginning in 1948, helps to put this construction history in perspective. It reflects the net gains from new construction, against mounting obsolescence and rapid growth in population. In addition to inventories, these plans show the remaining need in each category of hospital, according to standards prescribed by the basic act and regulations thereunder.

The annual summary of beds and additional needs from 1948 to 1955 is contained in table 2. This record shows that there are today nearly 260,000 more hospital beds in the country than in 1948; of this number, 220,000 are acceptable beds. On the other hand, 27,000 more non-acceptable beds are recorded. The net progress in reducing the total backlog of need has been limited, amounting to about 70,000 beds, or less than 8 percent. Nationally, our general hospitals now have 73 percent of total requirements, while mental hospitals have only 56 percent of requirements, and chronic hospitals

**Figure 3.** Principal hospital categories show widely different patterns of shortages in relation to State income.



vide for the care of acute and long-term illness, under direct medical attention. However, skilled care, not requiring hospital resources, may be provided under medical supervision in nursing and convalescent homes. Diagnostic and treatment centers for ambulatory patients can do much to lessen the duration and effect of illness. Rehabilitation centers are another important form of health facility needed to restore disabled persons to the maximum degree of self-sufficiency. Total needs in these types of facilities and the existing plant are still unknown. A recent national survey of nursing homes (2) shows that there are now about 200,000 beds with skilled nursing care in such facilities.

The program of Federal assistance for hospital construction was broadened by 1954 amendments to the Public Health Service Act

to include additional assistance for facilities providing long-term care (either in chronic hospitals or in nursing homes), for diagnostic or treatment centers for ambulatory patients, and for comprehensive facilities for the disabled. Statewide inventories are still in process from which State plans will be developed for a construction program relating to these types of facilities.

### Summary

New hospital construction has been substantial throughout the postwar era.

Net gain in relation to total bed need has been considerable for general hospitals; additions to mental hospitals have not kept pace with population growth and obsolescence.

Statewide remaining bed need is unevenly

distributed and tends to be substantially higher in low-income States, with total construction volume smaller in low-income regions than in regions of highest income.

Growing attention is being given to related health facilities besides hospitals, in order to round out comprehensive health services.

Experience is maturing on broad planning for hospital bed needs, but need for other types

of medical facilities has just begun to be appraised systematically.

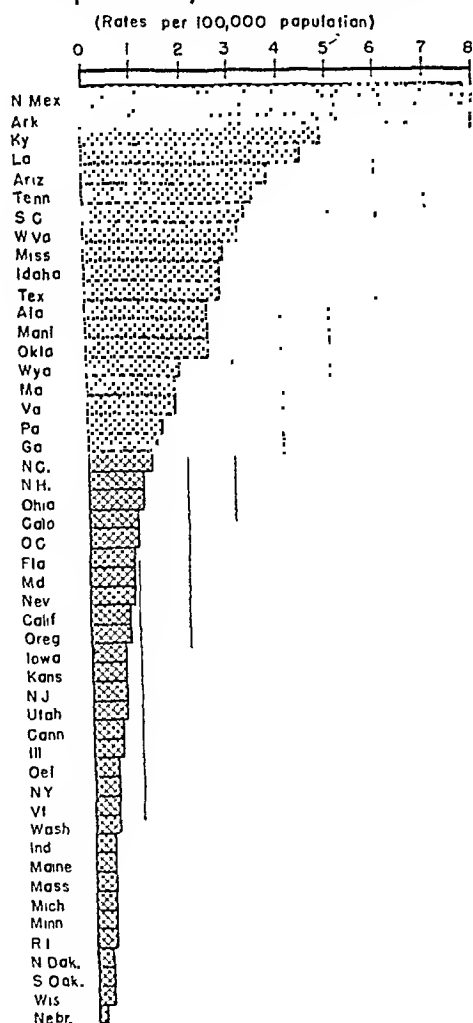
#### REFERENCES

- (1) Cronin, J. W.: Hospital construction—Progress and prospects. *Hospitals* 28: 53-55 (1954).
- (2) Solon, J., and Baney, A. M.: Inventory of nursing homes and related facilities. *Pub. Health Rep.* 12: 1121-1131, December 1954.

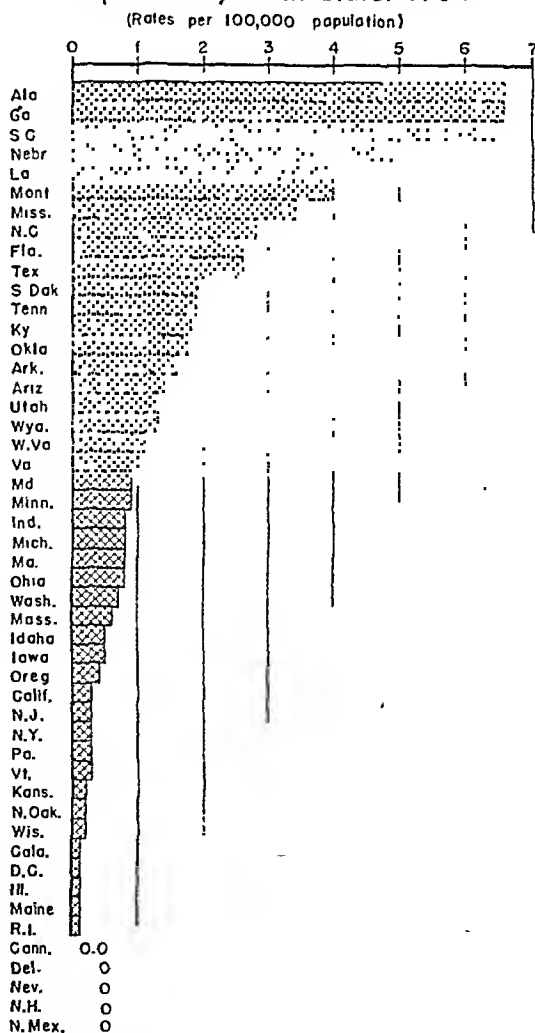
## trends

The provisional rates for typhoid fever and for diphtheria were 1.4 and 1.3 cases, respectively, per 100,000 estimated population for 1954 in the United States. Rates for each disease for individual States are shown in the charts below.

Provisional Rates for Typhoid Fever Cases  
Reported by Each State: 1954



Provisional Rates for Diphtheria Cases  
Reported by Each State: 1954



0.0 = Less than 0.05 0 = No cases

Charts from the National Office of Vital Statistics, Public Health Service



# How Charleston County Uses a Staff Newsletter

By GERALD J. SPECTER, M.P.H.

**N**EW AND VIEWS, the staff newsletter of the Charleston County (S. C.) Health Department, made its first appearance in December 1952. Since then, 30 issues have come off the press.

The idea of a house organ is not new. Nor is the use to which a house organ was put in our health department any different from what you would ordinarily expect to find. The value in using a departmental publication can only be measured by asking, "Does it accomplish what it has set out to do?"

Two years ago, there was a noticeable lack of communication among staff members and divisions in this health department. Each employee was busily engaged in performing his own particular job. Each division was principally concerned with its own objectives rather than with those of the overall department program. Each division saw health problems only in its own light.

Perhaps this atmosphere was partly due to a lack of understanding of each member's place on the health department team and of how one staff member could supplement the work of another. Could this be the situation?

What aid could the sanitarian be to the public health nurse in the district?

How did the laboratory staff fit into the picture?

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*Mr. Specter, public health educator, Charleston County Health Department, Charleston, S. C., since 1952, is also executive secretary for the Charleston County Safety Council and for the Charleston County Health Council. He was with the Pittsburgh City Health Department in 1949 and 1951 as a sanitarian.*

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What kept the statistical clerks, the clinic personnel, the laboratory technicians, and some of the lesser known workers so very busy?

What were we all doing?

For example: What were the sanitarians doing in connection with the county's new program of regulating subdivisions? What were the public health nurses doing to improve the rate of diphtheria immunization? What was the health council doing about dental health education in the public schools?

These were some of the questions that we thought needed answering if the "oneness" of team approach was to be achieved in our county. This problem of staff communication became the main topic of discussion at a meeting of the health officer and division supervisors, where it was unanimously decided to undertake to educate each staff member about the position on the team assigned to his teammates.

Many suggestions were offered. One was to hold staff seminars. Another proposed inservice training for each division, using these sessions for outlining the functions of all other divisions. A third suggestion was to have some method of keeping staff members informed and up to date on what was happening within the entire department.

The idea of circulating a monthly health department newsletter was broached to the staff. Each division would be asked to contribute information that would answer many of the questions staff members might have about other health jobs within the program. Staff members would also be invited to contribute personal items to give the newsletter an informal touch.

## News, Views, and Information

A poll of the entire staff told us that a newsletter would be received with enthusiasm, and plans were made to get into print as soon as possible.

No attempt was made to make *News and Views* a journalistic masterpiece. Its tone is informal, yet distinctive.

Early issues featured news about the activities of the various divisions.

The news is not confined to health department happenings specifically—mention is made of extra-curricular activities. Articles of special public health interest to the staff are also used. A special section in each issue is devoted to birthday greetings and mention of service records. Special stories cite honors received by employees.

As time went by, we received more news items than we could possibly use in a single issue. When this happened, we enlarged our newsletter from the original one sheet to double this size.

In format, *News and Views* is mimeographed on 8½-inch by 11-inch paper. Each page is typed in two columns. Items are kept brief, personal, and informal. There is no set space restriction. Only the amount of news received determines how many pages an issue will contain.

The early runs numbered 75 copies until requests for the newsletter from outside the county department began to come in. The circulation list has been expanded to include staff members of the South Carolina State Board of Health, members of our own board of health, members of the county council, the legislative delegates from our district and members of their staff, former employees of our department, local voluntary health agencies, and many others. Circulation now exceeds 250 copies.

A brief estimate of costs for a 4-side, 2-page issue, follows:

Supplies	Cost
4 stencils <sup>1</sup> -----	\$0.60
½ ream paper-----	.55
Ink (approximate)-----	.25
2d class postage-----	2.00
1st class postage-----	1.50
Envelopes -----	.80

Total cost for printing and mailing <sup>2</sup>----- \$5.70

<sup>1</sup> The masthead page can be produced in larger quantities in advance.

<sup>2</sup> 40 percent of distribution made in building where health department and other agency offices are located.

After 25 issues of the newsletter, in July 1954, we asked our 68 staff members to help us evaluate *News and Views*. Their answers to a

questionnaire provided a small study to help us determine whether the letter was accomplishing what it had set out to do.

### The Evaluation

The first inquiry dealt with the extent to which each staff member read the house organ—

80 percent said they read *News and Views* thoroughly.

5 percent answered that it was only partly read.

15 percent did not comment.

We next asked how well do most items interest the reader—

75 percent answered that most items were of interest to them.

10 percent indicated fair interest.

15 percent had no opinion.

Another question asked whether *News and Views* has helped the individual to know more about health department activities other than his own—

75 percent answered that it has helped.

10 percent answered that it has helped somewhat.

15 percent had no comment.

We also wanted to know to what degree, as a result of reading the newsletter, the reader became familiar with the overall program of the health department—

67 percent replied, "Very much more."

25 percent stated that they were only a little more familiar with the overall program.

3 percent said their awareness was the same as before.

5 percent did not comment.

Next, we asked whether *News and Views* helped clarify an individual's understanding of the health department's program by familiarizing him with the work of the various divisions—

70 percent indicated that it had accomplished this purpose.

5 percent indicated that it had not.

10 percent were undecided.

15 percent had no comment.

When we asked whether a newsletter such as ours helps cement relationships among staff personnel, we received a more divided reply—

58 percent thought the relationship was much improved.

32 percent felt relationships had improved a little.

10 percent had no opinion.

We then asked, "Do you think having a newsletter has been worth while?" To this—

85 percent answered, "Very much so."

5 percent said such newsletter was all right.

10 percent made no comment.

No one answered that *News and Views* was not worth while.

Our final question asked whether each staff member was satisfied with *News and Views* as it now stands—

85 percent replied they were satisfied.

5 percent believed some changes were in order.

10 percent did not comment on this question.

From their answers, the staff seems to think *News and Views* has helped to bring each individual closer to one another. It has helped, we believe, to contribute to the feeling of "oneness," so very much needed and has given direction and insight to the team approach.

We realize that a staff newsletter is not the complete answer, but from all indications, it seems to be a start in the right direction. Other steps being undertaken are joint planning, regularly scheduled general staff conferences, inservice training programs, and free exchange of ideas. There is no single panacea, but we hope all these efforts will produce results.

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## *An Important Date*



Each month your health department and many hospitals, laboratories, schools, clinics, and homes receive a copy of PUBLIC HEALTH REPORTS, mailed to arrive on the 20th, or even earlier, depending upon geographic location of the subscriber.

Its pages carry timely research reports, analyses of current trends, new methods, concepts, and ideas, and topical reviews for the busy scientist, teacher, or public health worker. Capsule coverage of important public health meetings, like those of the American Public Health Association, help the PHR reader.

Not all our readers receive the journal on the delivery date. An official copy is trickled down to them through a series of other readers. Sometimes the trickle slows to a complete halt.

You can have your personal copy promptly. Use the subscription blank on the inside back cover. Let the 20th of each month be an important date for you, too.

*Questions about the cause, the effect, the diagnosis, the infectivity, the clinical pattern, the prevention, and the treatment of trachoma are answered by an ophthalmologist from his experience and from the literature.*

## The Trachoma Story

By ARTHUR A. SINISCAL, M.D.

THE IMPORTANCE of trachoma "as a source of human suffering, as a cause of blindness, and as a national economic loss over large tracts of the world's surface is second to none among the diseases of the eye, or indeed, among diseases of all kinds."

Thus Sir Stewart Duke-Elder, a distinguished British ophthalmologist, assessed trachoma in a textbook published in 1934 (1). As late as 1950, it was estimated that 15 to 20 percent of the world population suffered from this disease (2).

Throughout the world, trachomatologists, ophthalmologists, sociologists, public health workers, and others are striving earnestly to improve the health and socioeconomic conditions of those afflicted with trachoma. But they wave no magic wand; what they accomplish, they accomplish through steady, organized effort, which depends in turn upon public understanding and support. The following pages tell of medicine's planned attack against this ancient infection.

According to Moutinho (3), trachoma was

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well known in the civilizations of the four great river valleys—the Hwang Ho and the Yangtze Kiang, the Indus and Ganges, the Euphrates and Tigris, and the Nile—many centuries before Christ. It was recognized and treated in ancient Egypt, Greece, and Rome, as well as in countries of Biblical fame. The Moslem conquests probably led to its spread to Europe as early as the eighth century (4), and, undoubtedly, Napoleon's campaign to Egypt in 1798–1802 was responsible in large measure for its dispersion among the Europeans (5).

Believed to have been introduced into the United States during colonial times by European immigrants (6), the disease was spread throughout a central belt reaching from the Allegheny Mountains to Kansas and Oklahoma, among the Indians as well as others. According to Cosgrove (7), the trachoma found in Missouri and Arkansas originated from persons who came into these States from Tennessee and Kentucky. The trachoma in New Mexico and Arizona and probably California is believed to have come from Mexico (8).

Today, trachoma is found on every continent (4). It is common in most of Asia, where it affects from 30 to 60 percent of the population. It is somewhat common in Europe, where it affects approximately 5 percent of the population. More prevalent in the Balkan States and in northern European countries than elsewhere on

that continent, it is present also in France, the Netherlands, Germany, Austria, Hungary, Italy, Ireland, Great Britain, Norway, Sweden, and Denmark.

Once a serious public health problem in the United States, particularly in the central portion where it is considered endemic, trachoma is now relatively rare. It is still present, however, in Missouri and Arkansas and, to a lesser extent, in southern Illinois. In Missouri, active cases are found in the southern half of the State, particularly in the cotton-growing lowlands and in remote regions of the Ozark hill country. Accounting for 1 out of 4 pensioners on the State's blind pension roll 25 years ago, trachoma now is the disease of only 1 out of every 10 blind pensioners.

Questions asked most frequently about trachoma are given here with the answers available from the experience of many workers. Although much is known about the cause, the diagnosis, the clinical manifestations, and the prevention and treatment of this disease, not every question can yet be answered finally or completely.

### *What Is Trachoma?*

Trachoma is an infectious disease of the external lining membranes (or conjunctiva) of the eyeball and eyelids. It causes an inflammation of chronic duration, characterized by burning, itching, excessive lacrimation, and photophobia. Generally insidious in onset, it develops usually at a slow pace and is somewhat resistant to treatment. The disease is localized strictly to the conjunctiva of the eyelids and eyeball and to the tarsus and the cornea. The pathological changes in the tarsus and the cornea are deep seated and usually irreversible when once established. Persistent duration of inflammatory symptoms may lead to blindness, which results from corneal opacification and disintegration and, further, from cicatrized deformities of the eyelids and eyeball.

### *What Is the Cause of Trachoma?*

The etiological agent is believed to be a large virus or inclusion body of the group which includes the psittacosis and lymphogranuloma venereum viruses. The inclusion body of

trachoma is indistinguishable morphologically from that of the virus causing inclusion blennorrhoea of infants and swimming pool conjunctivitis of adults (also called paratrachoma). Some workers have regarded the agents of these infections as belonging to the *Rickettsia* group, but Bengtson's (9) research has shown that the trachoma bodies are rather distinct from the rickettsiae. Generally speaking, the view is taken that the trachoma body is a virus, but the question has not yet been finally settled. The dividing line between bacteria and rickettsiae or between rickettsiae and viruses is not sharp.

A great majority of scientists now believe that trachoma is due to the organism discovered by Prowazek and Halberstaedter. In 1907, they described cytoplasmic inclusions, the presence of which in the epithelial cells of the conjunctiva and the cornea manifests the first detectable sign of the disease in the laboratory. Thygeson (10) has pointed out that these intracellular parasites are relatively large particles and that their life cycle is very similar to that of the psittacosis and lymphogranuloma venereum viruses.

There is need for more research on the causative agent or agents of trachoma. The exact nature of the organism will remain obscure until it is definitely isolated and successfully cultivated.

### *How Are the Eyes and Eyesight Affected?*

If the infection is allowed to progress without treatment for several months or longer, a lymphoid infiltration in the conjunctiva and in the subepithelial tissue will result in hypertrophy and thickening of the conjunctiva and eventually in connective tissue formation and scarring. Even the tarsal plates are involved and may become buckled or deformed as a result of cicatrization. Follicles may or may not develop, but the absence of these should not rule out the presence of the disease (11, 12).

The most serious pathological complication of trachoma is considered to be the formation of pannus, which is a vascular invasion under the epithelium of the cornea. When pannus is allowed to progress centrally, the pupil becomes obscured by this veil-like opacity. Trichiasis,



**Florid pannus covering complete upper half of cornea, as seen in advanced stage of trachoma. Pannus is pathognomonic of the disease.**

a condition of ingrowing eyelashes, results from cicatrization of the lid structures; it causes the eyelashes to rub against the cornea, thereby destroying the epithelium and predisposing to ulceration, perforation, and dense corneal scarring. Blindness may be due to diffuse corneal scars in general, or to pannus formation over the pupillary area, or occasionally to secondary uveitis following perforation of the chamber and prolapse of its contents, resulting eventually in phthisis bulbi.

### *Is Pannus Essential to the Diagnosis?*

Although the presence of typical trachomatous pannus is a solid basis for making a diagnosis of trachoma, its absence does not absolutely rule out the diagnosis. Some observers (13-16) believe that any one or more of the following signs should be sufficient to establish a diagnosis of trachoma: (a) presence of typical follicles; (b) presence of pannus; (c) presence of cicatrization; (d) punctate depressions at the periphery of the cornea resulting from

cicatrization of corneal follicles; (e) finding of the inclusion bodies.

A study by Rice and Smith (17) of the records for 1,154 cases of trachoma found that 88 percent showed the presence of pannus involvement of the cornea. According to Cosgrove (7), a definite diagnosis of trachoma cannot be made without pannus unless a proved case has been seen in the same family. Recently, however, Julianelle and Smith (18) observed that approximately 37 percent of early trachoma cases do not show any pannus, and Mitsni (19) states that even a microscopic pannus can be absent in the earliest stage in some cases of trachoma. Mitsni observes that in Japan, microscopic pannus can be seen in about 50 percent of trachoma cases during the acute stage, and that marginal punctate infiltration of the cornea can be seen in a smaller percentage of cases.

Cuenod and Nataf (20), who stress the value of slit-lamp biomicroscopy in their monograph on corneal studies (21), state that pannus is one of the most constant pathological signs of trachoma, but that they believe it possible for true trachoma to occur without pannus, especially



**Trachoma granules in the conjunctiva, as seen in the florid stage of the disease.**

the early stage. Nataf (22) states further that, in his opinion, it is possible for certain forms of the infection to occur without pannus but that diagnosis in such cases should be made with reservations. Nataf believes that trachoma may possibly occur in certain regions without pannus, but that in order to prove diagnosis in such cases it would be necessary to detect, after regression, the typical scarring pathognomonic of trachoma.

### *Why Is Early Diagnosis Important?*

As in other infectious diseases, early diagnosis and treatment of trachoma prevent its spread. Early discovery also makes it possible to prevent the advanced stages with their irreversible complications.

A clinical diagnosis of trachoma in its early stage is always difficult, since the classical landmarks of pannus, corneal infiltration, mature follicles, or cicatrization may not be present. The lack of agreement as to a definite differential diagnosis of early trachoma makes necessary a laboratory confirmation of the diagnosis whenever possible. However, because the virus is difficult to isolate or cultivate, a negative laboratory finding is unreliable.

Although the presence of inclusion bodies may clinch a positive diagnosis, their absence does not necessarily verify a negative diagnosis. The reason for this is that microbiotic or cellular findings typical of trachoma infection are not present throughout the length of the disease; it may be possible to find positive material from conjunctival scrapings early in the disease, but not always. In this connection a serologic test would be helpful. There is a clear-cut need for research on the serology and immunology of this disease.

The presence of several or all of the following signs plus a history of contact should make one strongly suspect that the diagnosis is early trachoma: excessive lacrimation with photophobia; papillary hypertrophy of the palpebral conjunctiva; a peculiar haziness of the lower cul-de-sac indicating diffuse infiltration therein; swelling and decreased rigidity of the upper tarsus; tiny filamentous symblephara in the upper fornices; large, discrete follicles; incipient pannus; and upper corneal infiltration. These signs may

occur in other conjunctival diseases, but in an endemic area of trachoma, one would be remiss in his duties if he neglected to take cognizance of them.

Lindner (5) states that in areas where trachoma is prevalent, every case of slight, ordinary conjunctivitis may be beginning trachoma. He considers the most important sign of the first stage to be the peculiar haziness of the conjunctiva of the lower cul-de-sac. Kuo (23) also stresses the importance of general haziness of the lower cul-de-sac, together with incipient pannus, in making an early diagnosis. Tabone (24) discovered that in a series of cases of eye infection in which diagnosis was difficult, approximately one-half of those tentatively labeled conjunctivitis later proved to be real trachoma.

### *Is Trachoma Highly Contagious?*

Trachoma is not highly contagious: otherwise, it would be more widespread than it is. Because trachoma is more likely to be transferred from one member of a family to another member than to contacts outside the home, it is sometimes referred to as a family disease, but it is not hereditary.

Important factors in the epidemiology of trachoma are general levels of living, particularly as they relate to sanitation and housing conditions, and geography and climate. Migration of infected persons into areas with high standards of domestic hygiene is not attended with danger, but such migration into areas with low standards of hygiene, where geographic and climatic conditions favor the disease, would tend to facilitate its dissemination.

Like other infectious diseases, trachoma is more likely to spread where unsanitary and overcrowded living conditions prevail. Although it is sometimes seen in persons of exemplary habits of personal hygiene, it is more likely to take root in persons who are careless about such matters. The use of a common towel to wipe the face, for example, is an almost certain invitation to the disease. Improvement in economic status, with its concomitant improvement in sanitation and housing, will materially aid in the elimination of the disease.

In general, a high incidence of trachoma is

observed in areas with a high mean temperature and little rainfall and in flood districts near the estuaries of large rivers. In all of these, sun, wind, and dust act as conjunctival irritants and are factors predisposing to the infection. In Missouri, trachoma is prevalent not only in the mountainous areas, where the climate is hot and the air dusty, but also in the cotton-growing lowlands of the southeastern delta, where the climate is humid and windy and the winds are dust laden.

### *Does Diet Have Any Effect on Trachoma?*

According to Rice and his co-workers (25), there is no evidence that a balanced diet supplemented with cod liver oil affected the course of trachoma in 18 untreated patients kept under observation for varying periods of time. However, it is the opinion of this writer, as well as that of other observers, notably Stucky (26) who made a great contribution to the prevention of trachoma in Kentucky, that inadequate diet and avitaminosis are contributory factors. At present, however, this concept must be regarded as unproved.

Glikson (27) states that his observations of over 25 years in Israel indicate that general nutrition is a decisive factor in an individual's immunity to this disease, and he adds that proper diet, including fresh milk and fresh, green vegetables, will shorten the duration of the disease or actually heal it. Murray (28) states that in South Africa adequate feeding supplemented by vitamin concentrates generally brings about a remarkable improvement within a few weeks even if no specific medication other than ablutions with saline is used. According to Bietti (29), if there is any importance in nutritional factors, lack of animal proteins and of calories is more likely to play a role than avitaminosis.

### *Are All Races Equally Susceptible?*

Generally speaking, all races are susceptible to trachoma in only slightly varying degrees. American Negroes seem not to acquire the disease, but miscegenates are not necessarily immune. Murray (28) reports that in South Africa, Negro tribes become afflicted with trachoma to a rather large extent. Extensive sur-

veys indicate that the disease affects about 29 percent of the natives in that area.

In Missouri, the disease predominates among persons of northern European ancestry, notably Irish, Scottish, English, German, and Scandinavian. Their forefathers formed the forward ranks of the pioneers who moved westward from the coastal States, bringing the infection with them. The disease became established in these families and still flourishes in some of their settlement areas, notably in the southern half of the State. Negroes in the State do not acquire the disease.

It is thought by some observers that the dark-pigmented races, especially Negroes, are more immune to trachoma than the light-pigmented ones. Seemingly in support of this contention is the fact that when trachoma in an Egyptian passes over to a European, the disease manifests itself much more rapidly and has a much more devastating effect. Wilson (30) states that trachoma tends toward spontaneous cure more frequently among Egyptians than among Europeans. He observes further that some of the Egyptians suffer little from this disease and that the lesions are mild in comparison with the lesions among Europeans.

Studies by Thygeson (31) indicate that the trachoma bodies show a predilection for the superficial cells of the conjunctiva without involvement of the basal cells and that they tend to spare the pigmented cells. This possibly could explain the resistance in certain dark-pigmented races to trachoma and the more favorable development of the disease among them.

Bietti (32) states that there are racial differences in the sensitivity to the disease and that the Negro particularly is more resistant. He does not maintain that degree of pigmentation is important, but rather that some innate racial characteristic itself is responsible. In support of this theory, he mentions that among various African native tribes of equal pigmentation, some tribes develop the disease more severely and in greater numbers than others.

Rice (33) believes that the severity of trachoma varies considerably in different parts of the world and even within the borders of our own country. He states that trachoma probably does less damage among the Chinese, for



instance, than it does among the white population of Missouri and Arkansas. Factors of immunity and adaptability may even be more important than factors of race.

To sum up, although trachoma is very widespread throughout the Near East and the Orient, the disease appears to be less distressing in natives of these regions than in Europeans and their descendants, among whom the prevalence is relatively low.

### Why Does Trachoma Still Exist?

Trachoma still exists because it was so widespread in the ancient civilized world and because, too, it did not receive the advantages of a modern medical campaign until the past 3 or 4 decades. Before the advent of sulfonamides and antibiotics, treatment was largely empirical rather than specific.

Until recently, there was little organized attack against this disease abroad and practically none in this country. The idea of international collaboration in trachoma control has been in existence for almost 100 years, but only with the founding of the Anti-Trachoma League and the International Organization Against Trachoma in 1923 did the idea progress to action. Their quarterly publication, *Revue internationale du trachome*, provides an authoritative and dynamic organ for the consolidation and dissemination of knowledge and facts about the disease.

At present, mass treatment of trachoma has been started by the governments of many foreign countries, notably Formosa, French Morocco, and Tunisia, with the assistance of the World Health Organization, and initial favorable results are reported. Projects are being planned in Yugoslavia and Egypt, and surveys in Western Australia (34) and in South Africa (28) have emphasized the need for action in these areas.

In the United States, a program of attack against the disease was begun in the Appalachian area in 1913 by the Public Health Service (35). During the next 11 years, one or more temporary diagnostic and treatment centers were set up in Kentucky, Virginia, West Virginia, Tennessee, North Dakota, Arkansas, Georgia, and Missouri, and in 1923 a permanent

Table 1. Operations performed at the Missouri Trachoma Hospital, 1932-53

Year	Number of patients admitted	Number of operations			
		Total	Gratage	Entropion	Other <sup>1</sup>
1932-33----	635	598	257	64	277
1934-35----	609	452	228	77	147
1936-37----	562	297	139	56	102
1938-39 <sup>2</sup> ----	468	137	65	53	19
1940-41----	750	143	25	69	49
1942-43----	934	181	60	36	85
1944-45----	868	111	25	21	65
1946-47----	893	114	25	33	56
1948-49----	1, 076	40	8	5	27
1950-51----	1, 179	61	8	11	42
1952-53----	1, 072	30	18	2	10

<sup>1</sup> Includes canthoplasties, electrolytic epilation, pterygia, dacryocystectomies, tarsiectomies, enucleations, and miscellaneous procedures. <sup>2</sup> No surgery done for 6 months in 1939 during changeover to new hospital.

hospital and clinic center was established at Rolla, Mo., by the Public Health Service in co-operation with the State. In more recent years, the States of the trachoma belt have carried on the battle against the disease.

### Can We Rid This Country of Trachoma?

During the past four decades, the prevalence of trachoma has decreased markedly (36). The program against the disease has been changing gradually from treatment of active, florid cases to the practice of preventive medicine and treatment of early and late and terminal cases. As shown by the data in tables 1 and 2, the number of operations performed at the Missouri Trachoma Hospital for trichiasis, entropion, gratage, and lid deformities and the number of cases of trachoma found among field clinic patients are declining steadily.

In the other States of the trachoma belt, the disease is no longer considered a significant problem. Arkansas has discontinued its extensive case-finding program, but within the next few years it will survey former high-incidence areas to see whether the disease has actually been eradicated. In southern Illinois, once an area of high incidence, a marked decline in the number of cases was observed between 1949 and 1953. No active cases have been re-

ported in the State since 1949. Kentucky discontinued its trachoma control program more than 4 years ago, and Oklahoma reports that the disease is now a negligible problem in areas where the incidence was once high. In Arizona and New Mexico, where an estimated 20 percent of the Indian population before 1938 was afflicted with the disease, a 1952 survey of the Indian reservation residents in all areas except Albuquerque found only 2.6 cases per 1,000 population.

With continued organized attack against this disease, it should be entirely wiped out in the

United States in time. Cooperation of independent ophthalmologists in trachoma areas and constant effort to teach the affected people good health habits will aid in reaching this goal. An improved standard of living and a rise in the general socioeconomic status are factors of importance.

### *What Treatment Is Given for Trachoma?*

At the Missouri Trachoma Hospital and generally in this country, the infection is treated with sulfonamide medications. Sulfonamide solutions are used as drops in the eyes several times daily, and sulfonamide tablets administered orally and sulfonamide ointments used nightly are adjunctive therapeutic measures. If the infection is in the early stage, treatment may be completed in approximately 3 weeks; if it is of long duration, treatment may last as long as 2 or 3 months, or even longer if the disease has become established.

Sulfonamides have been used to treat trachoma since about 1938, and most authorities agree they are active against the trachoma virus. More recently, the antibiotics have been used with favorable results in some instances. In the experience of this writer, the sulfonamides have proved more effective than any other therapeutic agents, the antibiotics appearing to be of secondary help (37).

Of the antibiotics, terramycin and possibly aureomycin seem to be most active against the trachoma virus (38-45). Chloramphenicol is considered much less effective, and penicillin, bacitracin, and streptomycin seem to be of little or no value in uncomplicated trachoma.

Mitsui (43, 44) reports that in Japan both acute and chronic trachoma respond well to terramycin treatment; but he observes further (45) that while in his opinion sulfonamides may not be the best agents against trachoma in these days of antibiotics, they certainly constitute a means of treatment in those cases that do not respond to antibiotics alone. Loe, who first used sulfonamides successfully against trachoma in 1937 among the American Indians in the southwest (46), has stated that in his experience the antibiotics have not proved successful in the treatment of this disease in Arizona and New Mexico.

**Table 2. Trachoma cases among patients of the Missouri Trachoma Hospital field clinics**

Year	Total number patients	New and old trachoma		New trachoma	
		Number cases	Per- cent of patients	Num- ber cases	Per- cent of patients
St. Louis County					
1941-----	83	17	20.4	11	14.2
1942-----	0	0	0	0	0
1943-----	229	35	15.2	27	11.7
1944-----	368	95	25.8	42	11.4
1945-----	217	65	29.9	25	11.5
1946-----	382	85	22.2	21	5.4
1947-----	411	41	10.0	11	2.6
1948-----	0	0	0	0	0
1949-----	112	15	13.3	0	0
Potosi, Washington County					
1945-----	135	62	45.9	35	25.9
1946-----	154	70	45.4	36	23.3
1947-----	90	64	71.1	30	33.3
1948-----	213	91	42.7	47	22.0
1949-----	244	140	57.3	58	23.7
1950-----	456	191	41.8	98	21.4
1951-----	780	241	30.8	108	13.8
1952-----	428	89	20.7	48	11.2
1953-----	159	54	33.9	8	5.0
Eminence, Shannon County					
1945-----	268	59	22.0	25	9.3
1946-----	264	42	15.9	14	5.3
1947-----	130	11	8.4	3	2.3
1948-----	289	107	37.0	50	17.3
1949-----	106	51	48.1	16	15.0
1950-----	125	58	46.4	20	16.0
1951-----	442	74	16.0	36	8.1
1952-----	464	42	9.0	25	5.3
1953-----	395	21	5.3	6	1.5

Cosgrove (47), director of the Arkansas State health program for trachoma control, believes that sulfonamides are the most effective agents against trachoma, and that the antibiotics, including the broad-spectrum group, have no effect against this disease.

### *Does Trachoma Tend to Recur?*

Trachoma is a disease of recurrences and relapses. The infection may have become dormant or latent so that not infrequently an arrested case may later show signs of activity. A recurrence may be due to the patient's having returned to an environment of smoke, dust, or wind, or to a mode of living not conducive to eye health.

Recurrences sometimes result from insufficient or inadequate treatment and occasionally from trauma, scarring, or possibly allergy. Some recurrences, of course, are due to reinfection from a member of the family who has not had treatment. All family members should be examined when trachoma is found to be present in one of them.

### *Is There a Definite Criterion of Cure?*

As yet there is no definite criterion of cure in trachoma. However, a combination of all the negative signs—quiescence of inflammation, deturgescence of the pannus, resolution of the follicles, a smooth, pink conjunctiva with or without cicatrices, absence of inclusion bodies—indicates that the disease is arrested. Without any one of these signs, the patient cannot be considered cured, even if no active lesion is present.

Thygeson (48) points out that, when confronted with the problem of distinguishing healed trachoma from trachoma of low activity, microscopic examination is helpful only in a limited way. The finding of inclusion bodies indicates trachomatous activity, but inability to find them, even on repeated examination, does not necessarily mean a lack of a trachomatous activity.

### *Is There a Worldwide Clinical Pattern?*

Although the cardinal signs of trachoma (follicle formation, pannus, cicatrization, and

the presence of inclusion bodies) are universally accepted, the disease varies considerably in different parts of the world and would therefore seem to be polymorphic. According to Lyons (49), trachoma may show variations in any of the following factors: (a) mode of transmission, (b) average age of onset, (c) clinical course and the resultant disability, (d) conditioning effect of secondary infection, (e) incidence of inclusion bodies at various stages of the disease, and (f) response to treatment with sulfonamides and antibiotics. Reports from workers in different countries illustrate some of these variations.

Lyons (50) states that in Egypt trachoma in its active stages causes surprisingly little disability; that gross thickening of lids is rare and the pannus seldom encroaches on the pupillary zone; and that photophobia and lacrimation are usually minimal and often absent. He adds that it usually is only the corneal lesions caused by neglected trichiasis in the late stage of the disease which lead to any serious reduction in vision.

Mitsui (45) of Japan declares trachoma to be an acute disease in its initial stage without exception. MacCallan (51) states that in Egypt and in eastern Europe, trachoma begins always with an inflammatory stage that continues for some time, but that in England the onset of trachoma in an acute or subacute form rarely occurs. He states further (13) that unmixed trachoma is always a chronic disease: that when it commences with acute manifestations or exhibits acute exacerbations, these are the result of superadded infections. Postic (52) of Yugoslavia observes that Mitsui's statement that all trachoma is acute in the initial stage must be taken to mean that such is the case in Japan, but not necessarily everywhere.

Gradle (6) states that trachoma in the United States varies somewhat with the characteristics of the population and the degree of sanitation present, but that entirely lacking is the onset of acute trachoma associated with ophthalmia, as seen so universally in Egypt. Lavery (53) states that in Ireland the disease usually starts insidiously, and that he has never seen an attack of acute trachoma. He reports, however, that

he has observed attacks of acute conjunctivitis superimposed upon trachoma.

In Missouri, trachoma is usually a chronic disease, progressing slowly over a long period of time; acute trachoma may occur, but only occasionally. In my experience, the disease takes from one to several months to show early clinical signs after contact with a known infection has taken place.

Birch-Hirschfeld (11) believes that the first stage of trachoma with its inflammatory infiltration passes early and imperceptibly into the stage of scarring and that the follicles are not of essential importance for the progress of the disease; that they are found both in early and late trachoma and are usually invaded and broken up by strands of fibroblasts.

The first appearance of the follicles on the conjunctiva may vary as to location. MacCallan (13) notes that in Egyptians the granulations appear first on the tarsus, but in Europeans, in the cul-de-sac (retrotarsal fold of the conjunctiva). Fuchs (12) states that papillary hypertrophy is a predominant feature of the tarsal conjunctiva, and that the retrotarsal fold is the seat of formation for trachoma granules. Among the white population of Missouri, it is in the retrotarsal fold that follicle formation is most pronounced and where the follicles first manifest themselves. When trachoma is seen in the florid form, however, a generalized follicular distribution throughout the conjunctiva of both tarsus and fornix in both the upper and lower lids is found.

In many, but not all, parts of the world, trachoma is frequently complicated with secondary infections, commonly the Koch-Weeks bacillus and the gonococcus (in epidemic and endemic form), and less frequently the Morax-Axenfeld diplobacillus and the pneumococcus. The associated infections greatly affect the clinical picture as well as the prognosis and the infectivity of the disease. Nataf (54) of Tunisia includes trachoma with secondary infections always; he believes that pure trachoma exists very rarely and that numerous infections are very often associated with it, the trachoma itself constituting the basic disease, the endemic and epidemic characteristics of which are conditioned by related disorders.

## *Do Associated Infections Affect Treatment?*

Most authorities agree that the associated infections of trachoma have a conditioning effect on treatment. Lyons (50) states that antibiotics usually produce rapid and striking improvement in secondarily infected cases and have little or no immediate effect in uncomplicated trachoma. Bietti (39) points out that sulfonamide and antibiotic treatments may give different results according to the country in which they are administered. In Egypt, for instance, where associated infections are the rule, the response to treatment by various sulfonamides and antibiotics may well depend on the conditioning effect of these infections, as well as perhaps on other factors. Pages' (55) survey of experiments has shown that the trachoma-bacteria complex is characterized by a kind of mutual stimulation on the part of the associated micro-organisms, or, in other words, a synergic attack. In the United States, where the complicated trachoma common in Egypt is seldom seen, sulfonamides have generally produced more favorable results than the antibiotics (37).

## **Summary and Conclusions**

Trachoma is a disease that may vary considerably in different parts of the world. Its clinical phase may be conditioned by climate, environment, associated infections, race, and general health and living conditions. From a worldwide point of view, therefore, both sulfonamides and antibiotics are useful in therapy, although sulfonamides have been found more effective in the United States.

There is definite need for research on the serology and immunology of this disease and on its causative agent or agents. In this connection, a more simple and more direct diagnostic laboratory test would be of infinite value in making an early diagnosis. A more clearly defined clinical picture of trachoma as it occurs in various regions of the world would make it possible to correlate better the results of chemo-antibiotic treatment. A universally accepted classification of trachoma would help clarify many questions of medical, administrative, investigational, and international character.

Although trachoma has been virtually eliminated from many areas of the world, the job of complete and universal eradication is not yet accomplished. The combined efforts of research, mass therapy, and preventive measures, however, are producing increasingly favorable results. New facts and new ideas in trachomatology are being brought to light and are being set forth in the literature. These reports help to define the disease, to recognize its variations, to make possible early diagnosis, and to determine the therapeutic methods most suitable for coping with it regionally.

The outlook today for a worldwide attack on trachoma is more encouraging than ever before, particularly because of better understanding between ophthalmologists and trachomatologists here and abroad; and because, too, of greater recognition by governmental authorities of the importance of this disease in relation to the health, economy, and welfare of the affected people.

#### REFERENCES

- (1) Duke-Elder, S.: Text book of ophthalmology. Ed. 1. St. Louis, C. V. Mosby Co., 1934, vol. 2, p. 1593.
- (2) Sorsby, A.: The task of ophthalmological research. *Brit. M. Bull.* 1: 102-104 (1943).
- (3) Montinho, H.: Legislation internationale contre le trachome, projet d'unification mondiale. *Rev. internat. du trachome* 26: 3-65 (1949).
- (4) Siebeck, R.: Trachoma in Europe and the Near East. In *World-atlas of epidemic diseases*. Hamburg, Falk-Verlag, 1952, pp. 79-80.
- (5) Lindner, K.: Trachoma. In *The eye and its diseases*, edited by C. Berens. Philadelphia, W. B. Saunders and Company, 1936, p. 423.
- (6) Gradle, H.: Trachoma in the United States of America. *Rev. internat. du trachome* 16: 143-145 (1939).
- (7) Cosgrove, K. W.: Trachoma problems in Arkansas. *South. M. J.* 34: 1037-1040 (1941).
- (8) Forster, W. G., and McGibony, J. R.: Trachoma. *Am. J. Ophth.* 27: 1107-1117 (1944).
- (9) Bengtson, I. A.: Question of the rickettsial nature of trachoma. *Am. J. Ophth.* 23: 770-779 (1940).
- (10) Thygeson, P.: The nature of the elementary and initial bodies of trachoma. *Arch. Ophth.* 12: 307-318 (1934).
- (11) Birch-Hirschfeld: Pathology of trachoma. *Rev. internat. du trachome* 16: 110-112 (1939).
- (12) Fuchs, E.: Text-book of ophthalmology. Duane Ed. 8. Philadelphia, Lippincott, 1924, pp. 454-456.
- (13) MacCallan, A. F.: Trachoma and its complications in Egypt. Cambridge, Cambridge University Press, 1913, p. 55.
- (14) Romero, E.: Mi experiencia en mas de cinco mil casos de trachoma. *Arch. Soc. oftal. hispano-am.* 9: 1107-1116 (1949).
- (15) Taborisky, J.: Trachoma in northern Russia and in southern Palestine. *Rev. internat. du trachome* 16: 201-208 (1939).
- (16) Ching, R.: A new trachoma concept. *A. M. A. Arch. Ophth.* 51: 750-761 (1954).
- (17) Rice, C. E., and Smith, J. E.: Trachoma in Missouri. *J. Missouri M. A.* 29: 13-17 (1932).
- (18) Julianelle, L. A., and Smith, J. E.: A statistical analysis of clinical trachoma. *Am. J. Ophth.* 26: 158-166 (1943).
- (19) Mitsui, Y.: Acute trachoma. *Rev. internat. du trachome* 29: 323-325 (1952).
- (20) Cuenod, A., and Nataf, R.: Le trachome. Paris, Masson et Cie., 1930.
- (21) Cuenod, A., and Nataf, R.: Biomicroscopie du pannus trachomateux au debut. *Arch. d'ophth.* 48: 737-742 (1931).
- (22) Nataf, R.: Le trachome. Paris, Masson et Cie., 1952.
- (23) Kno, P. K.: Incipient pannus in early diagnosis of trachoma. *Am. J. Ophth.* 29: 645-653 (1946).
- (24) Tabone, V.: Anti-trachoma campaign in Gozo (Malta). *Rev. internat. du trachome* 29: 56-57 (1952).
- (25) Rice, C. E., Sory, R., Smith, J. E., Faed, P. E., and Drake, A. A.: Effect of diet and vitamins on trachoma. *Am. J. Ophth.* 17: 735-741 (1934).
- (26) Stucky, J. A.: Observations and experiences with trachoma in eastern Kentucky. *Tr. Am. Acad. Ophth.* 35: 217-224 (1930); *Eye, Ear, Nose & Throat Monthly* 9: 455-457 (1930).
- (27) Glickson, J.: Observations on the trachoma problem. *Am. J. Ophth.* 33: 616-617 (1950).
- (28) Murray, N. L.: Trachoma in South Africa. *South African J. Clin. Sc.* 4: 119-203 (1953).
- (29) Bietti, G. B.: Il tracoma. Rome, Sanite Pubblica, 1947.
- (30) Wilson, R. P.: Trachoma: A selection of personal observations and experiences. Giza Memorial Ophthalmic Laboratory, Report No. 14. Cairo, Egypt, The Laboratory, 1939-1944, pp. 24-25.
- (31) Bietti, G. B.: Le trachome; vue d'ensemble des travaux de la période de guerre et d'après guerre (Trachoma; summary of the literature of the period of the war and after the war). *Bibl. ophth. Basel* No. 58, pp. 232-333.
- (32) Bietti, G. B., and Cavara, V.: Le manifestazioni oculari delle malattie da virus e da rickettsie. Bologna, L. Cappelli, 1952, p. 184.

- (33) Rice, C. E.: Trachoma in the native white population of the United States. *Sight-Saving Rev.* 3: 105-114, (1933).
- (34) Mann, I.: Ophthalmic survey of the Kimberley Division of Western Australia. Perth, W. H. Wyatt, 1954.
- (35) Williams, R. C.: The United States Public Health Service, 1798-1950. Washington, D. C., Commissioned Officers Association of the United States Public Health Service, 1951, pp. 286-295.
- (36) Siniscal, A. A.: Trachoma in Missouri. *Arch. Ophth.* 42: 422-437 (1949).
- (37) Siniscal, A. A.: The sulfonamides and antibiotics in trachoma. *Am. J. Ophth.* 35: 671-683 (1952).
- (38) Antibiotics in trachoma—Bibliography. WHO/Trachoma/8. Geneva, World Health Organization, 1951.
- (39) Bietti, G. B.: Treatment of trachoma by various antibiotics and chemotherapy. WHO/Trachoma/17. Geneva, World Health Organization, 1951.
- (40) Fernandez, P.: Aureomycin in the therapy of trachoma. *Arch. Soc. oftal. hispano-am.* 13: 79-99 (1953).
- (41) Freyehe, M. J.: Chemotherapy of trachoma. *Bull. World Health Org.* 2: 523-544 (1950).
- (42) Naccache, R.: Terramycin in trachoma. *Brit. J. Ophth.* 37: 106-108 (1953).
- (43) Mitsui, Y., and Tanaka, C.: Terramycin, aureomycin and chloramphenicol in the treatment of trachoma. WHO/Trachoma/2. Geneva, World Health Organization, 1951.
- (44) Mitsui, Y., and others: Terramycin in the treatment of trachoma. WHO/Trachoma/9. Geneva, World Health Organization, 1951.
- (45) Mitsui, Y.: Use of the new antibiotics in the treatment of trachoma. WHO/Trachoma/16. Geneva, World Health Organization, 1951.
- (46) Loe, F.: Sulfanilamide treatment of trachoma. Preliminary report. *J. A. M. A.* 111: 1371-1372 (1938).
- (47) Cosgrove, K. W.: Local use of sulfanilamide in trachoma. *Am. J. Ophth.* 23: 911-913 (1940).
- (48) Thygeson, P.: Criteria of cure in trachoma. *Rev. internat. du trachome* 30: 450-462 (1953).
- (49) Lyons, F. M.: Observations on the international coordination of research in trachoma. WHO/Trachoma/4. Geneva, World Health Organization, 1951.
- (50) Lyons, F. M.: Dual problem of acute ophthalmia and trachoma in Egypt. WHO/Trachoma/20. Geneva, World Health Organization, 1951.
- (51) MacCallan, A. F.: The initial signs of trachoma. *Rev. internat. du trachome* 27: 112-117 (1950).
- (52) Postic, S.: Comments on document WHO/Trachoma/16; "Use of the new antibiotics in the treatment of trachoma" by Dr. Y. Mitsui. WHO/Trachoma/27. Geneva, World Health Organization, 1951.
- (53) Lavery, F. J.: Incidence and clinical type of trachoma in Europe. *Rev. internat. du trachome* 16: 137-143 (1939).
- (54) Nataf, R.: Organization of control of trachoma and associated infections in underdeveloped countries. WHO/Trachoma/19. Geneva, World Health Organization, 1951.
- (55) Pages, R.: Role of seasonal acute conjunctivitis in the development of trachoma. WHO/Trachoma/7. Geneva, World Health Organization, 1951.

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# STOP RHEUMATIC FEVER

## Health Education Unit

A film, a discussion guide, and a general information booklet and folder make up the new health education unit recently released as part of the "Stop Rheumatic Fever" campaign being conducted by the National Heart Institute of the Public Health Service and the American Heart Association.

The unit provides materials for use in State and community programs for the prevention of rheumatic fever—a leading cause of disability and death in childhood and producer of heart damage in children, adolescents, and young adults. The materials are based on medical recommendations for preventing rheumatic fever. These recommendations were drawn up by the American Heart Association's Council on Rheumatic Fever and Congenital Heart Disease and were published in the April issue of *Public Health Reports*, p. 373.

Done entirely in animation with much human interest appeal, the film symbolizes rheumatic fever as a smoky flame which sometimes flares up, sometimes lies almost dormant—the character of the disease itself. Streptococcus infections that come from the germs which cause sore throats, tonsillitis, scarlet fever, and some other diseases are symbolized as the forerunner of rheumatic fever.

The guide provides a synopsis of the film. It suggests pertinent remarks for the user to make before showing the film, including a sample 2-minute introduction. Delineated are important points to be emphasized in discussion after the film is shown. Information useful in answering audience questions and sources for further information are given.

The booklet offers a condensed version of the film content and is illustrated with pictures from the film. It provides information about streptococcal infections and on what to do about them to prevent rheumatic fever. It is useful for distribution to film audiences to aid in retention of content and for future reference and also as educational literature in general health information and rheumatic fever programs.

The folder describes rheumatic fever and its association with a preceding streptococcal infection. It helps parents to know when to call a physician and what to tell him about their child's sore throat. It contains a chart of questions on signs and symptoms, helpful in determining whether or not a child has a "strep" sore throat. Affirmative answers indicate the need to call a physician promptly.

**FILM.** Stop Rheumatic Fever. 16 mm., sound, black and white, 12 1/2 minutes, 1955. Prepared by National Heart Institute, PHS. Produced by Transfilm, Inc. Cleared for television.

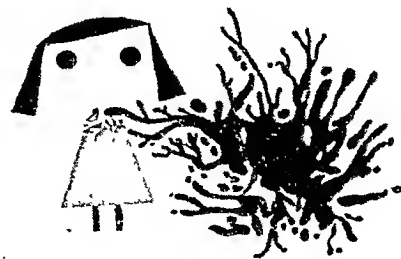
**Audience:** General public. Suitable for showing before parent-teacher groups, in the classroom, community health meetings, luncheon clubs, and other similar meetings. On television may be used as complete presentation, or preliminary to a physician's talk or other discussion.

**Available:** Purchase—American Heart Association Film Library, 13 East 37th Street, New York 16, N. Y. Price \$15. Rental distribution not being made since purchase price is so low.

**DISCUSSION GUIDE.** 4 pages. Copy accompanies each print of the film. Single free copies obtainable from American Heart Association, 44 East 23d Street, New York 10, N. Y., or from local heart associations.

**BOOKLET.** Stop Rheumatic Fever. Public Health Service Publication No. 420. 1955. 16 pages. Single free copy accompanies film. Additional copies obtainable from the National Heart Institute, Bethesda 14, Md. Quantities may be purchased from Superintendent of Documents, Washington 25, D. C., at \$4.00 per 100.

**FOLDER.** Now You Can Protect Your Child Against Rheumatic Fever. Free copy accompanies film. Additional copies available from the American Heart Association, 44 East 23d Street, New York 10, N. Y., or local heart associations. Quantities are \$1.65 per 100.



An octopus-like representation of the streptococcus germ, closely resembling its microscopic appearance.

# A Rural Sanitation Program

—Lancaster County, Nebraska—

By LESTER A. SANGER, C.E.

THE DEVELOPMENT of rural sanitation programs has followed at quite a distance the development of sanitation programs in urban and fringe areas of relatively high population density. This is an understandable pattern assuming that the magnitude and importance of environmental sanitation problems are directly proportionate to the population density. However, the isolation of rural villages and farm homes is rapidly fading, and the rural population now contributes measurably to the environmental health problems of a region.

There are many ways to develop a rural sanitation program, and it would be improper to draw any inference that the procedures in Lancaster County, Nebr., are necessarily a model for others to follow. The procedures may, however, contribute to the planning of programs in similar areas.

The prelude to the sanitation program in Lancaster County was the reorganization of the health department.

## Community Profile

Lancaster County covers 864 square miles of gently rolling farm land and has 21 small

towns, 6 of which range in size from 200 to 450 people. Exclusive of the city of Lincoln, with a population of approximately 100,000, the county has a population of about 20,000. The people are of German, Bohemian, Dutch, Russian, Irish, and English descent. There are 80 rural schools and 15 consolidated town schools.

During 1945 and 1946 the Lincoln City Health Department was reorganized to meet the standards of a modern full-time local health unit. This involved the addition of professional public health personnel to the staff and major revisions in the organization and activities of the department.

The civic groups that were instrumental in the modernization of the Lincoln City Health Department, chiefly women's organizations, joined hands with their rural counterparts and began to "beat the drums" for the organization of a combined city-county health unit. They recognized the desirability of extending health services to the fringe areas surrounding Lincoln and, indeed, to the entire county.

Meetings with numerous civic groups and rural organizations were followed by public hearings conducted by the board of county commissioners during the winter of 1946-47. These public meetings were interesting demonstrations of democracy in action. It was conspicuous that the decisive force for the organization of the combined city-county unit came from several women leaders in the community and the organizations they represented. The

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*Mr. Sanger is the director of the division of sanitation, Lincoln-Lancaster County Health Department, Lincoln, Nebr.*

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Lincoln-Lancaster County Health Department became a reality July 1, 1947.

### The Rural Sanitation Program

A preliminary survey of the county revealed that the geographic distribution of environmental sanitation problems could be classified into four main groups:

1. Fringe areas adjacent to Lincoln.
2. Town areas (including the usual problems of food sanitation, private sewage disposal, water supplies, insect and rodent control).
3. Farmstead sanitation (water and sewage).
4. Schools (rural and town).

The Lincoln-Lancaster health department chose to launch the rural sanitation program through the medium of a school sanitation program. It would permit the department to distribute a service uniformly throughout the county. Many sanitary improvements in the school environment were needed, and the county superintendent of schools was not only the respected authority throughout the rural school system, but also he was influential within the family of county officials.

During that first school year, the rural sanitarian made a complete survey of all rural and town schools. The survey consisted of checking on the standard items of school sanitation: water supply, toilet facilities, school lighting, and so forth.

In most schools the survey was conducted as an educational experience for the teacher and children, especially in the one-room rural schools. At every opportunity the sanitarian stressed the importance of a safe school water supply and sewage disposal system, and emphasized that the same applied to their own farm wells and toilet facilities.

Long before the survey of all schools was completed, the health department began receiving requests to talk at Grange and parent-teacher association meetings. These meetings provided the opportunity to introduce the parents to public health in general, to the services we could give for the asking, and, in particular, to specific details of safe farm water supplies and sewage disposal systems. The

meetings followed a somewhat standard form—formal presentation of the material supplemented with a short movie on some aspect of public health and followed by the customary informal discussion.

These informal gatherings and the free discussions that followed were of great value in helping the sanitarian to get personally acquainted with many people and facilitated release of the typical reserve of rural mid-westerners.

Requests for participation in these rural meetings soon overburdened the rural sanitarian, and it became necessary to obtain assistance from other members of the staff, notably the public health educator and public health nurses. Many requests for speaking engagements and technical services were received through the county extension agent. The county agent contributed as much as, or more than, any other individual to the introduction of health services among the rural populace. He contributed further to the program by donating the first set of septic tank forms.

By November 1947 we were getting calls from all over the county for technical assistance in planning the layout of septic tank systems and for advice on how to improve private water supplies.

### Septic Tank Installations

The demand for septic tank installations made it necessary to build two more sets of forms. We built one set and induced a local lumber company to build a set. For each use of the forms, we charged a rental fee of \$5.00 to cover maintenance and replacement of forms.

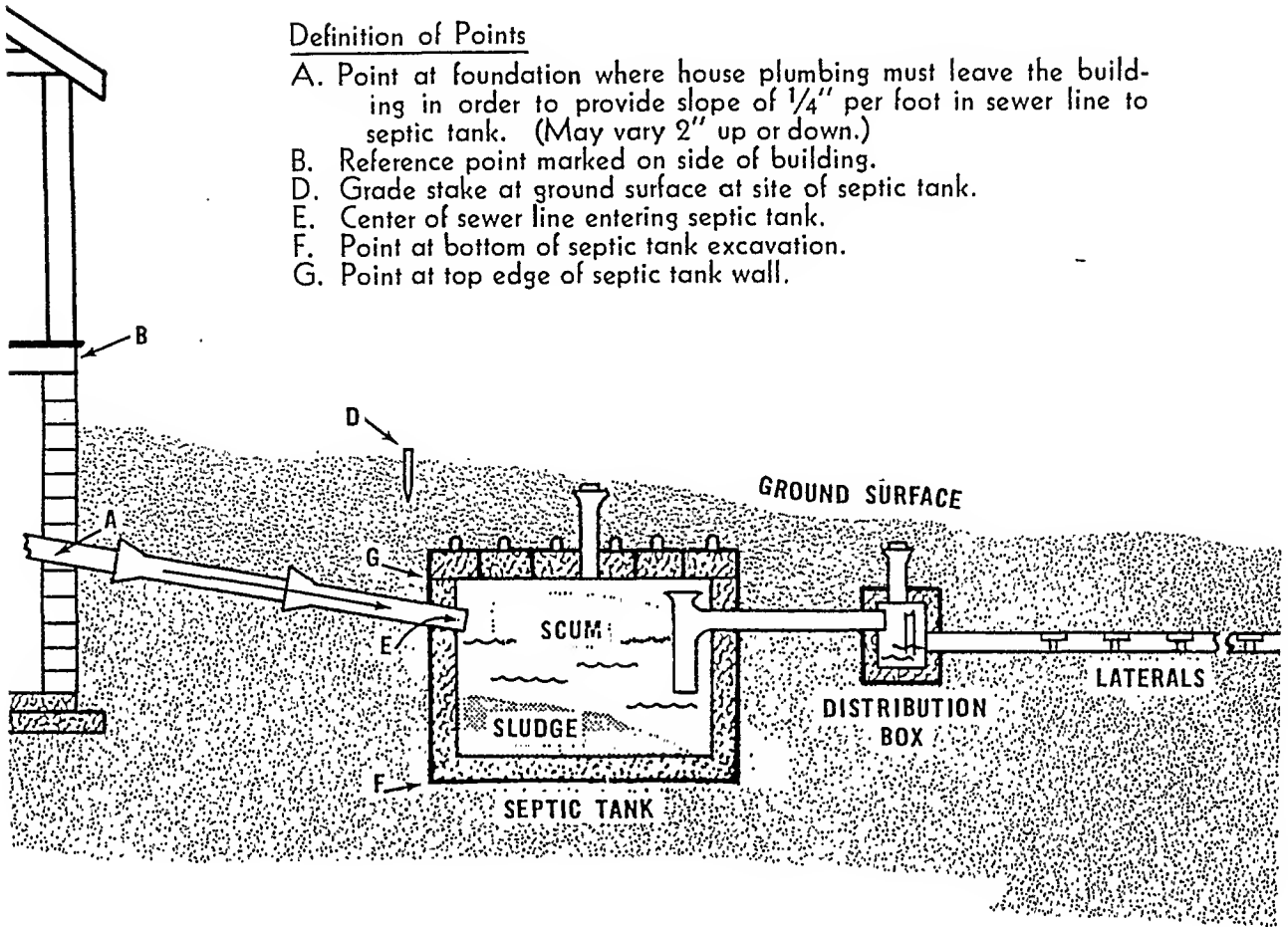
Each request for assistance was handled approximately as follows:

1. A date was set for the sanitarian to visit the home, lay out the system, and explain to the farmer what materials he needed to make the installation.
2. On the day the ready-mixed concrete was to be delivered for the tank and distribution box, the sanitarian was there several hours ahead of delivery time to make a final check on the setting of the forms, construction aids, and other details. The sanitarian on these occasions was not dressed to attend a wedding. I mention dress-

Figure 1. Septic tank work sheet.

Definition of Points

- A. Point at foundation where house plumbing must leave the building in order to provide slope of  $\frac{1}{4}$ " per foot in sewer line to septic tank. (May vary 2" up or down.)
- B. Reference point marked on side of building.
- D. Grade stake at ground surface at site of septic tank.
- E. Center of sewer line entering septic tank.
- F. Point at bottom of septic tank excavation.
- G. Point at top edge of septic tank wall.



NOTE TO PLUMBER:

The house sewer pipe must leave the building at point A (2" + or -) which is \_\_\_\_\_ ft., \_\_\_\_\_ in. below point B marked on outside of house. The center of discharge end of sewer to septic tank (E) must be \_\_\_\_\_ ft., \_\_\_\_\_ in. below grade stake D (2" + or -).

NOTE TO SEPTIC TANK CONTRACTOR:

The tank is to be located \_\_\_\_\_ ft. from dwelling.  
 The hole for septic tank must be dug to a depth (D-F) of \_\_\_\_\_ ft., \_\_\_\_\_ in.  
 The top edge of form (G) must be \_\_\_\_\_ ft., \_\_\_\_\_ in. below grade stake D.

NAME \_\_\_\_\_ PHONE \_\_\_\_\_

ADDRESS \_\_\_\_\_ OWNER \_\_\_\_\_

REMARKS:

LINCOLN CITY-LANCASTER COUNTY  
 DEPARTMENT OF HEALTH

DATE \_\_\_\_\_

Sanitarian \_\_\_\_\_

Form S-600, Sept. 53.

ing appropriately as much because of the unheralded public relations significance as provision against construction errors. The sanitarian usually remained at the site until the concrete was in place.

In planning the installation, the sanitarian chose the location for the septic tank, distribution box, and disposal field. By use of an inexpensive surveyor's level (\$54) he established a profile for the entire system. After establishing the profile, he filled out in duplicate a septic tank work sheet (fig. 1). One copy was given to the farmer and the other was placed in the office files for possible future reference.

Many modifications of the features shown in figure 1 were used, but, generally, they have been installed with a house sewer slope of  $\frac{1}{4}$  inch per foot, free discharge into the tank, no baffles, 3-inch drop in flow-line between tank inlet and outlet, T-connection on effluent line, 500-gallon concrete tank with sectional cover slabs, observation ports in septic tank cover and distribution box cover, depth of liquid in septic tank of 4 feet, distribution box provided with baffle and several standby discharge openings (plugged), and 3 to 6 separate tile lines for disposal field.

One noteworthy modification of the tile field used occasionally is an installation we have called an "under-drain system." It consists of two levels of drain tile separated by 24 inches of gravel, the lower-level tile discharging into a stream or ravine ultimately seeking disposal by way of natural surface drainage. The idea is not new, but our experience indicates that this is a very satisfactory method in cases where, due to soil density, ground water, or space limitations, conditions do not favor the standard tile system.

The health department has installed approximately 200 concrete septic tanks with its forms and has supervised at least another 100 systems using poured-in-place concrete, precast concrete, tile, or metal septic tanks. Many of the systems have been revisited to see how well they work and to check on certain technical details.

During a check of several systems in January 1950 (2 years following installation), tanks that had little or no protective earth covering were particularly noted. Although the winter temperature had averaged 18° F. for more than a

month, the temperature of sewage in tanks with concrete cover slabs exposed, averaged 41° F. A distribution box with only a loose piece of canvas as a temporary cover showed a liquid temperature of 38° F.

Another significant observation was the relatively larger volume of scum than is indicated in the literature on septic tank operation. In most installations the depth of scum was equal to sludge depth, and in some the scum depth exceeded sludge depth. Probably, the primary contributing factor is the higher percentage of animal fats and greases that the farm home discharges in its sewage, and to this extent, at least, domestic farmstead sewage is different from urban sewage.

In all of the installations, the influent sewer pipe terminates approximately 1 inch beyond the inside face of the septic tank wall and discharges the incoming sewage by free fall. In spite of the extensive buildup of scum, in no case was any obstruction to the incoming sewage observed.

From these observations, the sanitarian has concluded that the following principles of septic tank construction in this area are sound.

1. With a minimum of earth covering, there is no reason to fear freezing in septic tanks, distribution boxes, or tile fields.

2. More consideration should be given to sludge storage capacity in tanks serving rural homes; any baffling that would restrict sludge storage capacity is considered detrimental.

3. Free-falling influents are totally satisfactory operationally, simple to construct, less expensive, and facilitate maintenance of the house sewer.

Peeking into the digestion chamber and bowels of an operating septic tank system may lack esthetic appeal even for conscientious sanitarians, but these explorations were of great value in reinforcing junior sanitarians' confidence in the accepted principles of septic tank sewage disposal systems.

### Private Water Supplies

Requests for help in improving private water supplies throughout the county paralleled requests for aid in installing septic tanks. In private water supply improvements, above-

ground installations using some of the established principles of good well construction were stressed, and many improvisations were used.

Although Lancaster County does not have all types of surface geological formations influencing problems in well construction, there are enough of them to tax the sanitarian's inventiveness. One of the most unique problems is the scattering of underlying salt beds. To avoid these salt water horizons, we often called on the State geologist to help locate new wells. The source of ground water in Lancaster County is, for the most part, obtained from the mantle-rock of unconsolidated glacial drift. The salt water horizons giving trouble in relatively shallow private wells generally occur along the valleys of Salt Creek and its main tributaries. Salt Creek, running diagonally across Lancaster County from southwest to northeast, is the major stream in the county. Also, in some areas of the county there are pockets of impervious shales and clays, yielding their entrapped water with extreme reluctance.

Due to these geological restrictions and the cost of drilling new wells, the greatest challenge was to rehabilitate existing wells. Except in wells requiring only the elimination of well pits, most of the rehabilitation work dealt with tile-cased and dug wells. With few exceptions these wells were altered by replacing the existing upper 10 feet of tile casing or well wall with 4- or 6-inch diameter steel well casing.

The program of improving farm water supplies was on a voluntary or promotional basis. Consequently, there were no inhibiting restrictive regulations in making these improvements. In private wells, there is at least as much individuality as with human fingerprints, and the great variety of unorthodox but extremely practical techniques a resourceful sanitarian can use in improving farm water supplies is remarkable. The sanitarian has used so many old cultivator wheels, windmill sway-bracing, hog fencing, and the like, in rural sanitation work that he has difficulty interpreting the neat drawings normally attached to approved standards and regulations.

Another complicating factor in the private well improvement program was the occasional occurrence of excessive nitrate nitrogen

( $\text{NO}_3\text{-N}_2$ ) in wells. Several cases of infant cyanosis (methemoglobinemia) were reported, and investigation revealed that high nitrate nitrogen in private well water supplies was the causative agent. A complete analysis of this problem would constitute a separate report, but the following comments are considered sufficient as a summary here.

In a group of 30 wells showing nitrate nitrogen concentrations in excess of 10 p.p.m., ranging from 10 to 108 p.p.m., construction alterations to prevent entrance of surface contamination into the wells have effectively reduced the objectionable nitrate nitrogen. Although numerous articles on the subject suggest that nitrate nitrogen is, in some cases, indigenous to a particular aquifer, our experience in Lancaster County strongly indicates that high nitrate nitrogen in well water is due to either a direct short circuiting of surface contamination into the well, or a recent indirect zonal contamination of the aquifer. Partial chemical analyses on investigated private water supplies have become somewhat routine along with the sampling for bacteriological analyses. This activity of the program is considered a good example of teamwork between the public health nurse, the health officer, and the sanitarian.

Local well drillers are, of course, an indispensable part of the well improvement program. Well drilling is characteristically an inherited craftsmanship, and unfortunately some of the old well drilling practices are not in harmony with present day standards of sanitation. It requires more than a little tact and perseverance to convert the well driller to these new ideas; to question his methods is tantamount to insulting his grandfather. In spite of these inherent characteristics, it is essential to indoctrinate the local well drillers with good sanitary practices. If this is properly accomplished, sanitarians will soon discover many new wells of good construction on which they were not even consulted.

### Town Water Supplies

When the rural sanitation program was started, only one of the four town water supply systems was an approved above-ground instal-

lation. All pits have now been eliminated and in other respects altered to comply with State health department regulations.

These improvements were accomplished by a combination of techniques—repeated visits with town officials, attendance at council meetings, insistence on frequent sampling and analyses of their supplies. Also, we were opportunists. In one town, complaints of tastes and odors from residents necessitated major repairs to an oil-lubricated vertical turbine pump, and the town officials were convinced that other improvements might just as well be made at the same time. In another town, a spring flood gave us an assist. While muddy flood waters were still knee deep in the town pump house, the sanitarian invited the town water commissioner to wade out with us to see how things looked. It wasn't good. A series of samples showing evidence of contamination helped us on the third well.

In addition to improving existing town wells, three other towns have been induced to construct water supply systems. As in the case of town well improvements, these new water supply systems were the culmination of executive and public meetings with town boards reinforced with survey data on contaminated private wells and the mingling of private sewage disposal systems with private wells. These three new town systems are of the same basic design: 6-inch steel cased well, vertical turbine pump, pressure tank—all housed above ground in a neatly constructed pump house (fig. 2). They have a cast iron distribution system with fire hydrants. The average population of these towns is 170 people.

### Rural Food Establishments

At the time of meeting with town boards to discuss water supplies, the sanitarian also requested permission to inspect local taverns and cafes. It was considered essential to contact town officials before entering the eating and drinking establishments. With the exception of taverns, our program of food establishment sanitation has not been on an enforcement basis. By resolution of the city-county board of health, the same general sanitation regulations of the Lincoln food ordinance, patterned after the

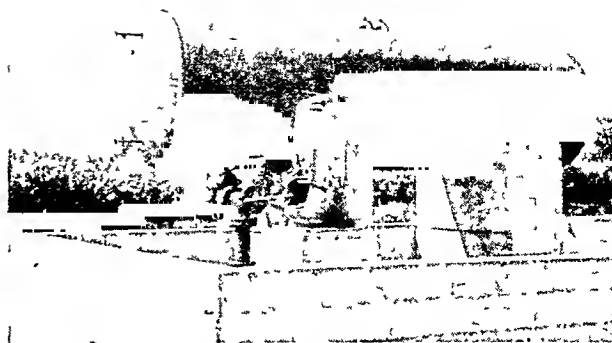


Figure 2. New town well prior to construction of pump house.

Public Health Service Ordinance and Code, are to apply to food and drink establishments elsewhere in the county. On rare occasions, the health department has appealed to the town boards to help in getting corrective action.

Taverns are issued licenses by the State liquor commission through the county commissioners of the respective counties. We have a working agreement with our county commissioners whereby no license is approved until they have received a satisfactory sanitation report from our department. This has been very successful in gaining improved sanitation in these places, and there are seldom any difficulties with the operators.

### Other Activities

There is opportunity to supply numerous other services in a rural sanitation program, some by request and others by promotion. As the services of the department became known throughout the county, we received many calls in the nature of nuisance complaints. Several spring floods afforded us the opportunity to give emergency service during the floods, and following floods we conducted spraying operations in towns as fly and mosquito control measures. We always made a special effort to be conspicuously present (sincerely) in all areas affected by the floods, even at the expense of being up at all hours of the night. Any town isolated by flood waters was contacted by phone to show our concern for the town well or private water supplies. The county commissioners purchased

a power sprayer for our use in spraying operations in the county. We have conducted town surveys on private sewage disposal facilities and in this way have induced incorporated towns to adopt more comprehensive sanitary codes.

In retrospect it seems that there are almost limitless opportunities to give worthwhile services in a rural sanitation program.

### Summary

It is proper and requisite that local health services be expanded to include rural sanitation activities whenever local interest is favorable. Based on experiences in Lancaster County, Nebraska, the following generalized comments are submitted as possible guides in the development of rural sanitation programs in other areas.

1. Before launching a rural sanitation program, a careful study should be made of the sanitation problems, local prejudices, personalities, and attitudes. Keep in mind that it may not always be advisable to assault the problems of highest public health priority.

2. A rural school sanitation program is a convenient and effective way of introducing the rural sanitation program to the rural community. It results in a prompt demonstration of services, uniformly distributed over the area,

and has a better than even chance of a warm reception.

3. Regular and periodic visits with key officials (county commissioners, superintendent of schools, town boards, county extension agent) is an essential rule of conduct.

4. Re-indoctrination of local well drillers is essential to the extension of properly protected private water supplies.

5. Installing properly constructed septic tank sewage disposal systems is the most demanding of all activities of the sanitarian's time and energy. Procedures for properly installing these systems should be streamlined as rapidly as possible; local contractors should be informed of the essential specifications and induced to do the work without direct supervision by the sanitarian.

6. To be successful, the rural sanitarian must like evening meetings with rural people. He must be friendly, sincere, and patient.

I am convinced that skillful application of the principles outlined are as essential to a successful rural sanitation program as technical knowledge of the sanitary sciences. Conducting a rural sanitation program is a rewarding and satisfying experience; it has no equal as a training ground for sanitarians, and no other activity in sanitation affords such an opportunity for the exercise of diversified talents.



# PHS Exhibits

## Diagnostic Techniques

Three exhibits—"Breath Sounds on Tape," "Heart Sounds on Tape," and "Screening for Diabetes"—specially designed for teaching devices and refresher courses may be borrowed from the Public Health Service.

### Breath Sounds on Tape

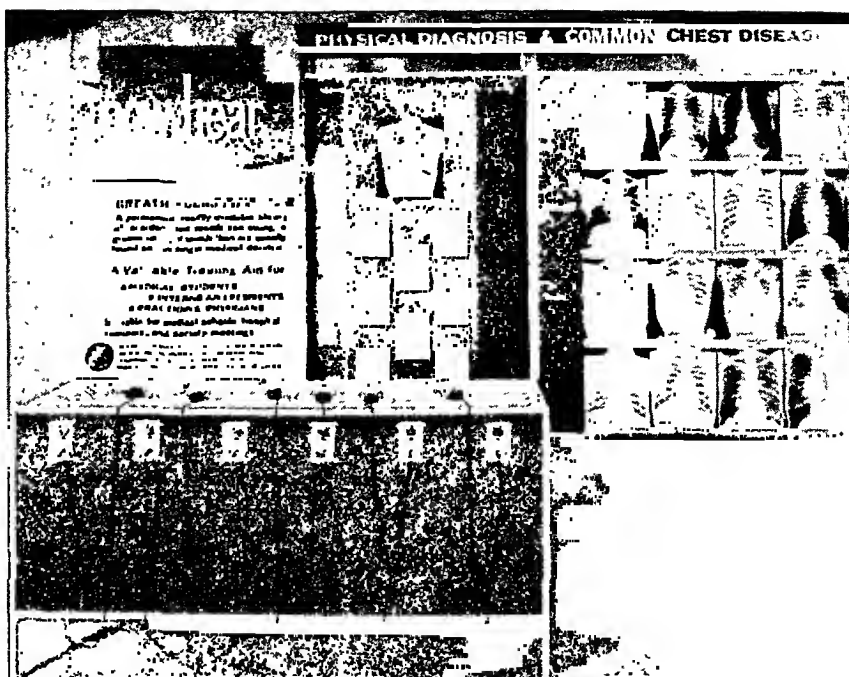
Tape recordings of normal and abnormal chest sounds prepared by Dr. William B. Walsh of the Georgetown University Medical Center are synchronized with illuminated chest films in a 4½-minute cycle. The continuous tape may be heard through a bank of stethoscopic earphones or from a loud speaker.

Breath sounds on tape was exhibited at the 1954 scientific show of the American Medical Association in San Francisco.

The exhibit weighs 1,300 pounds and requires a booth 14 by 20 feet.

### Heart Sounds on Tape

Recordings of heart sounds, prepared under the general direction of



Dr. W. Proctor Harvey of the Georgetown Medical Center, have been used by the Public Health Service as an exhibit.

The exhibit with high-fidelity sound equipment offers a 5-minute sample of heart sounds with explanatory comment. These sounds may be heard with head phones or a loud speaker.

A full set of teaching tapes, which require about 4½ hours for the com-

plete run, may be borrowed, together with the special playback equipment.

The exhibit weighs 1,400 pounds and requires a booth 14 by 20 feet.

### Screening for Diabetes

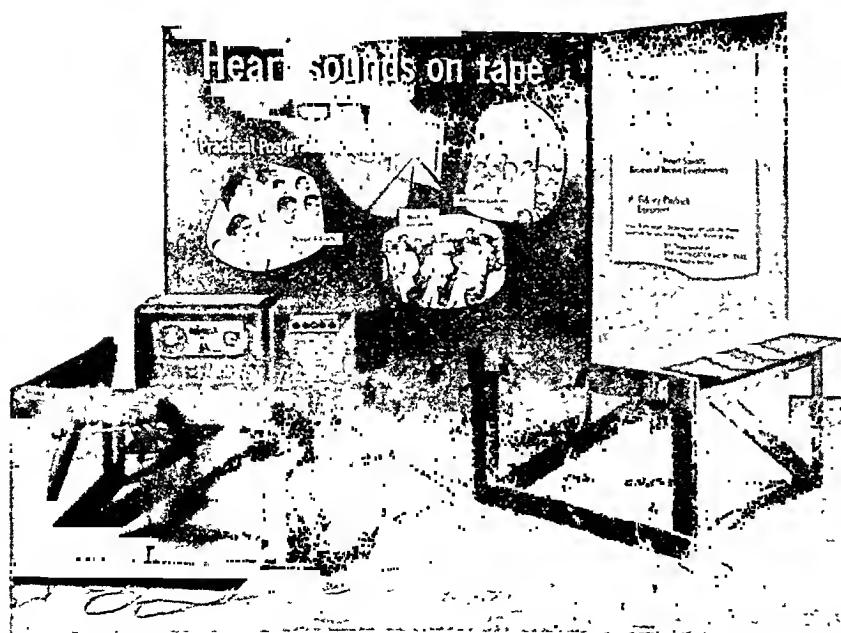
An exhibit featuring a continuous three-dimension motion picture, in color and with narration, has been produced by the Public Health Service to demonstrate the Wilkerson-Heftmann method of blood screening for diabetes.

This true glucose screening test can be performed in the physician's office in about 5 minutes at a cost of about 15 cents.

Although the exhibit (including the film) will not be distributed generally, it is available for showing at national and State medical meetings.

A booth 10 feet deep and 20 feet wide is required for the showing. The exhibit weighs 681 pounds.

For information about these exhibits, write to the Division of Special Health Services, Public Health Service, Department of Health, Education, and Welfare, Washington 25, D. C.



# Public Health Speaks

"Public Health, an institution of the people and for the people, needs to speak out, unafraid," states the program for the 43d annual session of the North Carolina Public Health Association which was held in Raleigh, September 23-25, 1954. Three of the several papers dedicated to this theme are presented here in brief form. A fourth, *Where Do We Go From Here in Public Health?* by Dr. Wilson T. Sowder, will be published in full in an early issue of the *American Journal of Public Health*.

## Efficient Management In Health Departments



Continued progress in public health depends in part on research and increased knowledge in the health sciences, but of equal or even greater importance is the efficient application of the knowledge to meet the needs of the public.

### Overall Administration

In this day when there is a tendency to look intently at overhead expenses of all agencies, some State boards of health seem inclined to dispense with State and district supervisory personnel and assign them as field workers. Some departments are discussing the idea of replacing registered nurses with licensed practical nurses, sanitarians with "inspectors," and

health officers with lay administrators. Is this because of a real shortage of personnel and the fact that individual staff members are better trained and therefore need less supervision and management? Or is it because our management is so indifferent and inefficient that those in control of the money feel that it can be more effectively used by employing a larger staff of lesser trained and qualified personnel at lower salaries?

If the health officer is concerned only with the medical aspects of his job and pays little attention to efficient management of his staff and program, then the question may well arise, could not his full time be spent as a clinician and he be replaced with a qualified lay administrator? In small- and medium-sized health units of 6 to 8 employees, we should strive to have every member of the staff so well educated and trained as to require a minimum of supervision. In units with large staffs, it may be possible to save money by the use of lesser trained and qualified personnel, such as practical nurses, nurse aides, and inspectors, to carry on routine functions in clinics or to check on nuisance complaints. But when such personnel are to be used, it becomes mandatory to

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*By C. L. Guyton, M.D., M.P.H., assistant State health officer of South Carolina.*

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have well-trained and well-qualified supervisory staffs.

### **Recording and Using Health Data**

Basic responsibilities of a health department are the recording and analysis of data on births, deaths, and notifiable diseases; maintenance of registers of individuals known to have certain diseases or disabilities; and the collection and interpretation of morbidity data from all available sources. Analysis of these records will frequently bring to light unrecognized health needs.

There is need not only for a record system that contains health data but for one that records activities of the staff and contains all the data that can and will be evaluated to the betterment of the service. Records should list such things as home visits, clinic attendance, and facilities inspected or surveyed. More important, they should tell what has been accomplished as a result of these activities. Such records will assist staff members in planning their day-to-day work, serve as a basis for program evaluation and revision, and become documentary evidence of work accomplished. But, before instituting a new record, always ask yourself, will it be useful and will it be used? A record that will serve only to collect data and dust should not be adopted.

Registers of persons known to have certain chronic diseases or impairments are usually kept and referred to with a great deal of pride by the administrator. Frequently, however, they are not put to good use because they are not analyzed and reviewed from time to time. A study of these registers will often show that certain diseases tend to be more prevalent in certain geographic areas or among certain social and economic groups. This should lead to an evaluation of that particular program to determine if it is meeting the needs of this particular area or group.

### **Health Education and Information**

Every public health worker is engaged daily in health education. Every public health activity is, or at least should be, of health educa-

tion value. Otherwise, the activity has been inefficiently performed.

However, we must also have a planned program of health education and information; otherwise, the community will soon take our activities for granted. Like any other program, this one must always have a definite objective. If we decide to stimulate or motivate the public through newspaper articles or radio or television programs, then these must be for a definite purpose. If a film is to be shown, it must be directed toward a definite educational goal. Classes should be well planned, and the teaching should be supported by all the educational media available.

Group teaching can save much time in giving basic information on diet, preparation of formulas for babies, operation of food-handling equipment, and the like. However, we should not forget the adage: "What I hear I forget. What I see I remember. What I do I know." This means that classes and group instruction will have to be supplemented with individual counseling and teaching regarding those activities that the individual must "know."

Fortunate is the health unit that has a trained health educator on its staff, for he is an expert in the efficient management of all the tools of health education. Every State department of health now has one or more health education consultants. They can be of great assistance not only in health education programs but in stimulating community interest in health activities and in planning the overall program of the local unit.

### **Supervision and Regulation**

The laws of our States give health departments legal authority to supervise and regulate many activities in the field of health. If a department frequently finds it necessary to resort to legal action, then it is performing this responsibility in an inefficient manner. Health laws and regulations are usually established to set a standard and to serve as a starting point for the education of those concerned. Legal action to enforce them should be the last resort.

Is it not better to keep in touch with housing projects and to contact the development agency

early so as to inspect the site, test the soil, and agree on size of septic tanks, for example, than to wait until the buildings and tanks are completed and we are asked to make final inspection? We should prevent public health problems as well as disease.

Are we to continue our programs of inspecting dairies, food-handling establishments, and other institutions in a routine manner with a check sheet and grade card? When are we going to organize classes for operators and their staffs to educate them to operate their facilities properly and to assume responsibility for compliance with regulations? When are we going to include counseling as an integral part of inspection programs?

### **Direct Environmental Health Services**

With the rapid advancement in health consciousness by the public and the rise in our economic level and general standards of living, many of the direct environmental health services are no longer required. They could be dispensed with if we educate the public regarding them sufficiently for individuals and families to assume more responsibility for the control of their environment. The efficient health department will engage only in those activities which require the use of trained public health personnel and which cannot be carried out by lay persons and groups.

Now that we have practically eradicated malaria, are we to continue a spray and fogging program to keep people comfortable? Or are we to educate the public that this activity is no longer a health measure and should be transferred to another agency?

Are we to keep on advocating the building of pit privies in rural areas when we know full well that even a trained health educator could not motivate you and me to use one in the cold gray dawn of a winter's day? Would it not be better to raise our vision from the lowly pit and observe the new power lines that have been extended into rural areas and to persuade the home owner to install an electric water pump, which eventually will lead to the installation of a plumbing system and proper sanitation of the entire home environment?

### **Personal Health Services**

Improved sanitation and the use of modern drugs and treatment have markedly reduced the need for some of our immunization programs. If administration of personal health services is to be efficient, we must review our morbidity data and adjust our immunization programs to fit present-day community needs.

Are we to continue routinely to give typhoid inoculations to large groups of citizens now living in a sanitary environment, without a single case of typhoid over a period of years, just because we have trained them to submit to the annual roundup? Would it not be better if we analyzed the morbidity records and surveyed the environmental sanitation of the various communities and then limited such programs to areas where they are needed?

When are we going to stop limiting our rabies control program to the immunization of household pets and the vaccination of children and begin to attack the problem at its main source by preventing stray dogs from running at large in the community?

Are we going to continue to conduct chest X-ray surveys in which we routinely X-ray the same persons year after year, even though we find little or no tuberculosis among them? Would it not be better to concentrate on those communities and those social or economic groups which are less readily available but which would yield much higher dividends in cases diagnosed?

Are we going to continue inspecting school children by the thousands just because we have them congregated in an easily accessible place and wish to point with pride to a large number of individual services? When are we going to concentrate our activities on those pupils that have been screened out by teachers and nurses?

### **Operation of Health Facilities**

We constantly preach efficiency in the operation of restaurants and schools and in the sanitation of homes and their environment, but, I ask in all sincerity, are we efficient in our health centers, auxiliary centers, and other places where clinics are conducted? Just because we use an auxiliary center a few hours once or

or terminal malignant disease. A few of these patients have had remissions. Some remissions were brief, but others continue. Another new antibiotic has been shown to exhibit carcinostatic activity. The growth of mammary adenocarcinomas in mice has been inhibited.

Experimental studies on fungal infections, previously refractory to all antibiotics, indicate that a number of new antibiotics possess sufficient antifungal activity to warrant clinical trial. One group of these was obtained from among the products of streptomyces filtrates. Another new antibiotic has been tried in experimental mycotic infections in mice with considerable therapeutic success. Approximately 75 percent of the test animals survived cryptococcosis, coccidioidomycosis, and sporotrichosis. A number of other agents have exhibited an ap-

preciable fungistatic effect in preliminary laboratory studies.

The reports revealed a continuing search for new antibiotics. Organizations which have already discovered or developed a number of useful agents appear to be intensifying their efforts for still more advanced preparations with respect to breadth of spectrum, greater tolerance, and greater pathogenic specificity. The 14 new antibiotics reported at the symposium are given in the table.

### Safety Measures

Measures stressed during the symposium to enhance the safety of antibiotics and prevent abuse in using the agents were:

1. Elimination of the indiscriminate or incorrect use of antibiotics.

2. Systematic and comprehensive education in antibiotic application at the undergraduate, graduate, and postgraduate levels.

3. Wide public dissemination of the fact that self-medication is dangerous and that the common practice of demanding antibiotic medication from physicians should be abandoned.

4. Proper labeling of all antibiotics with warning as to the possible toxic reactions and the dangers of indiscriminate use.

The symposium was sponsored by the Department of Health, Education, and Welfare, Food and Drug Administration, Division of Antibiotics, in collaboration with the journal *Antibiotics and Chemotherapy*. The proceedings have been published under the title of "Antibiotics Annual, 1954-1955," and may be purchased from Medical Encyclopedia, Inc., 30 East 60th Street, New York 22, N. Y.

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## Program for Juvenile Delinquency

Ten long-range goals designed to improve methods of dealing with juvenile delinquency have been outlined by the Division of Juvenile Delinquency Service in the Children's Bureau.

The new division is seeking to help States and communities:

1. Acquire, in every community of 20,000 or more population, at least one police officer with special training in working with juveniles. Bigger cities will need a specialized juvenile division.

2. Make good detention facilities and services available to every juvenile court in the country so that juvenile delinquents will not have to be detained with adult criminals.

3. Provide expert physical and psychological examinations for each youngster in serious trouble before the courts decide what kind of care and treatment is needed.

4. Staff all courts with civil service probation workers trained in social services for children.

5. Establish juvenile court laws and practices that meet the standards recommended jointly by the National Probation and Parole

Association, the National Council of Juvenile Court Judges, and the Children's Bureau.

6. Provide for juvenile delinquents training schools that have complete programs of education, health, mental health, recreation, and followup and provide one staff member for every 15 youngsters.

7. Focus the training on the individual youngster to help him find a satisfying, responsible role in the community.

8. Establish in each State at least one special institution for emotionally disturbed youngsters, separate and apart from adults.

9. Provide coordinating mechanisms through which public welfare, health, mental health, employment, courts, policy, training schools, and educational agencies can plan programs and pool experiences with private agencies.

10. Make regular and comprehensive reports on what is happening to juvenile delinquents so that States and communities and the Nation can measure progress toward the goal of an irreducible number of youngsters who get into trouble with the law.

Adequate prenatal care is also essential. It must include a complete history and physical examination followed by periodic examinations at stated intervals. The initial examination is not complete unless it includes a serologic test for syphilis and a determination of the Rh status. A chest X-ray is certainly highly desirable and perhaps should be mandatory. The mother must be encouraged to report any irregularities, and any untoward signs or symptoms must be explored immediately.

### **Nutrition Important**

Recent research studies of nutrition and pregnancy point up the fact that nutrition means more than counting calories. These studies indicate that when the prospective mother's diet is good and deficiencies are corrected by supplements, the incidence of toxemia is lower than when nutrition is inadequate. They show that fetal and neonatal mortality rates and the incidence of premature birth are lower among mothers whose diet is adequate. They further point out that toxemias of pregnancy are more prevalent in women who are underweight than in those whose weight remains within average limits. To preserve the health of mothers and infants, a sound nutrition program must be promoted.

The prospective mother must be protected against syphilis and tuberculosis. A diagnosis of syphilis demands all our efforts to cure or arrest the disease; these efforts will, in turn, almost always protect the fetus. A diagnosis of tuberculosis demands close medical observation, supervision, and education throughout pregnancy and the removal of the infant from the maternal environment immediately after birth.

In view of what is known of the role of German measles during early pregnancy and its effect on the child, measures for the prevention of this disease must be instituted.

### **The Basic Program**

The prime objective in maternal hygiene is the conservation of life and health of the expectant mother and her developing infant. This objective leads us to promote a program in

which medical care is made available to every pregnant woman and in which she is persuaded to obtain care throughout the maternal cycle.

It is desirable that this service be provided by a single physician of the patient's choosing, but when unavailable in this way, the service should be provided through community facilities.

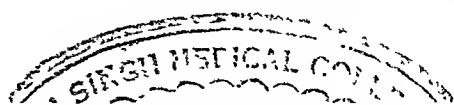
The seriousness of activating a program of maternal survival is accentuated by this fact: In any year of recent date, there were more deaths as a result of complications and sequelae of pregnancy than there were deaths from such communicable diseases as diphtheria, scarlet fever, poliomyelitis, meningitis, and typhoid fever. When one realizes that deaths related to pregnancy occur in only one period of life and in only one sex, the gravity of the situation is readily apparent.

### **Preventing Infant Deaths**

The salvage of lives of infants and children within the last 25 years has been the major factor in the increase of life expectancy. Progress has been made in reducing mortality not only in the infant age group (0-1 year) but also in the later periods of childhood. Had mortality rates of a half century ago prevailed last year, approximately 1,000,000 children aged 15 years and under would not be with us today. However, little if any progress has been made in preventing death during the first 28 days of life. The shorter the period of time after birth, the less marked has been the rate of decline in the death rate.

The causes of death in the newborn period are rather poorly defined, more so than in later infancy. Prematurity, congenital malformations, birth injuries, infection—these are the most frequently cited causes.

In a broad sense, we recognize certain hazards as contributing to infant mortality and particularly to neonatal wastage. Specifically, we recognize hazards of development and hazards of injury. We know that defects in development occur and that these may culminate in a monstrosity or congenital malformation. We also know that toxemia or an infection such as syphilis or influenza in the mother may exert its effect on the fetus. Mechanical injury to the



mother, injury to the infant incident to difficult labor, abortion—all these contribute to many preventable infant deaths. Exhaustion of the infant in trying to overcome an impassable barrier, injury to the cranial vault through injudicious use of forceps, and toxemic conditions in the mother further add to infant deaths, many of which perhaps are needless.

How shall they survive? Since factors contributing to early infant death, even fetal death, have their incipient stages in prenatal life, early and continuous medical supervision of the mother is as necessary for preventing infant deaths as for preventing maternal deaths. Constant medical observation of the mother permits detection of deviations or complications early enough for remediable measures to be instituted.

Medical supervision of the infant must begin immediately after birth. If conditions are favorable, the infant should receive a complete physical examination. Persistent medical and

nursing observation should follow. In home deliveries it is imperative that the public health nurse be involved to the extent of postpartum visits. The nurse, however, is cautioned to refer her observations first to the family physician.

Although premature birth is recognized as a sign rather than a diagnosis, it is recorded as the greatest killer of infants. The premature infant is born saddled with the threat of death. But many premature infants can be saved. Properly equipped and staffed hospitals which provide proper management of a premature delivery will go a long way toward this end.

If none of the three major killers of the newborn—prematurity, congenital malformation, or birth injury—is involved, the next compelling duty is the prevention of infection. It is here that the public health nurse plays a major role. Through her efforts, the mother is stimulated to maintain early care and observation of her child.

## Missed Opportunities In Tarheel Sanitation

**PHR** In this era of expansiveness—bigger production, greater markets, tremendous planes, stupendous bombs—public health is not unaffected, and there are those in our ranks who cast about for this and that new world to conquer. Nor is such wholly to be abhorred; rather it is commendable, provided merely that the conquering is in order.

But it does pay, at times, to take stock; to see where we stand; to search out the failures and the missed opportunities in order to achieve

improvement. Missed opportunities could be found in nursing or health officering or health educating—in any of the numerous public health persuasions. But it is sanitation shortcomings that will get the extra special treatment today. And have we here the makings of an epic, a saga of woe, a list of “it might have beens” the like of which Maud Muller never even dreamed?

### Milk and Meat

At the front of the parade of bedraggled specters is the Tarheel milk supply, fittingly white and at times elusive, as becomes a proper ghost. But we can't even call this a near miss: we're wide of the mark a country mile. It is devoutly to be desired that someday milk sanitation will be placed with the State board of health where it belongs. But, lest my remarks be interpreted as the anti-agrarian rantings of a noncomprehending city clicker, let me add that I would urge the use of the “Federal Order” in those areas of the State where producer protection is required.

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*By Millard B. Bethel, M.D., M.P.H., health officer  
for the city of Charlotte and Mecklenburg County,  
N. C.*

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So it is with milk, and so it need not have been. Had we been more astute, the whole business could have been tucked neatly away by now.

And so it will be with meat one day unless we all face up to the situation. There has been an awful lot of awful meat foisted upon North Carolina consumers. We in public health are in large measure squarely to be blamed, and, sooner or later, we shall pay the penalty. It is not enough for us to have reasonably good, reasonably clean abattoirs—or even perfect ones, for that matter. Meat, and poultry, too, must have ante-mortem and post-mortem inspection. Yet, few communities are doing even a fair job; and none of us can claim credit for a good job when poultry is considered.

Unfortunately, shade-tree meat is even more common in North Carolina than is barnyard milk. Our job will not be done until we have made them both a rarity.

The people in my town and my county are neither better nor worse than in yours. What we see in the Queen City is fairly representative of what is going on elsewhere in the State. Adulterated and contaminated foods need ever to be guarded against. Some will always be avaricious enough to add water to milk, and where there's little chance of being caught chicanery will be rampant. And as long as Old Bossy is held more dear than the Old Gray Mare, some unethical entrepreneur will put horsemeat into hamburger. You might say these practices are largely fraudulent and hence not within the realm of sanitation. I contend they are both and that good local sanitarians backed by good local or regional laboratories can make it all a bitter memory for the errant, a triumph for decency, and another safeguard with which we ought to surround our people.

## Stream Pollution

We are coming to grips in some measure with stream pollution and with refuse and garbage disposal but our local authority ought to be greater. Our urban laws are strict compared to those that prevail just beyond the corporate limits. Yet, some of the circumferential territory is much more thickly populated than certain areas in the town—and it is the same in half a hundred Tarheel communities—but we are not cloaked with sufficient legal authority to do a needed job there. I daresay, however, that even without extended authority we can find a few unturned stones. Let's get active in this business of stream pollution and waste and garbage disposal.

We have a hybrid job in the field of local public health—that of air pollution, occupational hazards, and accidents. In State health departments and in very large local health departments, there are appropriate bureaus, sections, or units at work in these fields, but such is out of the question in small local units. One can't call accidents, air pollution, and occupational hazards exactly missed opportunities in sanitation, but on the local scene they come close. We must try to match this hybrid job with a "hybrid" man. A crack sanitarian with special knowledge in these fields would be sure to earn the meager pay we'd be sure to grant him.

And thereby hangs the end of my woeful tale. For all those jobs, for this endless array of work, let's keep struggling to get good men—train them, pay them, and work their fingers to the bone. Get that kind of men, give them enlightened supervision, and back them with a good laboratory, and we shall have many fewer missed opportunities.

# technical publications

## Patients in Mental Institutions, 1950 and 1951

*Public Health Service Publication No. 356. 1954. 429 pages. Price \$2.00.*

This report was compiled from the 25th and 26th annual censuses of patients in mental institutions, the fourth and fifth such censuses to be conducted by the National Institute of Mental Health. It contains data on hospitalized patients with mental diseases and on patients in institutions for mental defectives and epileptics, both public and private.

More complete and greatly expanded over similar previous studies, the report contains 178 statistical tables showing certain characteristics of first admissions, resident patients, discharges, personnel, and expenditures. A bookkeeping account of the flow of patients into and out of mental hospitals and institutions is also given.

## Immunization Information For International Travel

*Public Health Service Publication No. 384. 1954. 56 pages. 20 cents.*

Official information on the immunizations required by each country as well as the immunizations recommended by the Public Health Service as precautionary measures for persons traveling abroad is contained in this pocket-sized book.

Other items include an explanation of the procedure for having vaccinations recorded on the International Certificates of Vaccination form; a list of designated yellow fever vaccination centers; and maps showing the areas of the world in which yellow fever is endemic and the yellow fever receptive areas of the United States.

Travelers may obtain information

on subsequent changes in immunization requirements from the Public Health Service or from State and local health departments and shipping and airline offices.

## The Physician in the U. S. Public Health Service

*Public Health Service Publication No. 394. Revised 1954. 14 pages. 15 cents.*

One of a series of pamphlets devoted to careers in the Public Health Service, this booklet describes opportunities for physicians in clinical medicine, research, epidemiology, administration, quarantine, and foreign service.

Basic information covers requirements for admission to the commissioned corps, duty assignments, rotation, pay scales, and benefits. Detailed information is given about activities in the various Public Health Service hospitals and the research program at the National Institutes of Health. The role of the Public Health Service in cooperating with local health organizations in carrying out public health programs is discussed and examples are given of emergency epidemiological services provided by the Service. Opportunities in overseas health missions are also covered.

## Sources of Morbidity Data, Listing Number 2. 1954.

*Public Health Service Publication No. 399. 90 pages.*

The second listing of projects in the files of the Clearinghouse on Current Morbidity Statistics Projects contains descriptions of 126 projects meeting the clearinghouse criteria, and supplements the 206 projects described in Listing Number

1 (Public Health Service Pub. No. 332).

As in the first listing, the projects are grouped into sections by major type of disease, injury, or impairment, with the following information, if available: (a) abstract of the project, (b) the organizations participating, (c) names and addresses of the principal investigators, (d) publication plans and references, and (e) the name of a person to contact for further information.

The statistical results of studies are purposely omitted because the clearinghouse is not intended to provide the findings from morbidity studies but rather to show where such data may be found.

Listing Number 2 has a section of supplementary notes on projects in Listing Number 1, which consists of information obtained through unsolicited comments from principal investigators whose projects were listed, or information collected by the clearinghouse staff in the course of other work.

The listings of the clearinghouse are published primarily for the use of actual and potential contributors and for other research workers in the fields of public health and medicine. Persons requesting information from the clearinghouse services are urged to specify the type of study in which they are interested.

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This section carries announcements of all new Public Health Service publications and of selected new publications on health topics prepared by other Federal Government agencies.

Publications for which prices are quoted are for sale by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. Orders should be accompanied by cash, check, or money order and should fully identify the publication. Public Health Service publications which do not carry price quotations, as well as single sample copies of those for which prices are shown, can be obtained without charge from the Public Inquiries Branch, Public Health Service, Washington 25, D. C.

The Public Health Service does not supply publications issued by other agencies.

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*Data on patients admitted to the National Leprosarium at Carville, La., show that leprosy in the United States is concentrated in a few areas of a few States. Nevertheless, the disease may appear in any section of the country.*

## Leprosy in the United States

By L. F. BADGER, M.D.

THE EARLIEST available reference to leprosy in the United States is found in Romans' Concise Natural History of East and West Florida, which reports the occurrence of the disease in that area as early as 1758(1). By 1766, the disease was sufficiently prevalent to cause the Spanish commissioner of Louisiana to establish a leprosarium near the mouth of the Mississippi River. From this evidence, it may be assumed that leprosy has existed in this country for at least 200 years.

The disease has been reintroduced frequently since its first appearance; primarily from Europe and Africa during the early years; later, from Asia; and, since the acquisition of extra-territorial possessions, from the Caribbean and Pacific islands.

The prevalence of leprosy in the United States, past or present, is difficult to determine. Many cases have not been recognized, and some cases known to physicians have not been reported. No nationwide case-finding program

has ever been conducted. However, an idea of the number of cases in recent years can be obtained from the records of the National Leprosarium at Carville, La. From the opening of that institution in early 1921 through 1953, 1,465 individual patients were admitted. One or more patients were admitted from 40 States and the District of Columbia (fig. 1). Thus, the disease may appear in any section of the country. (The State from which admitted was not recorded for four patients.)

Of the 1,465 patients, 637 (43.5 percent) were foreign born and 822 (56.1 percent) were American born. The birthplace of six patients is not known. Generally, throughout the 33-year period, the number of American-born patients exceeded the number of foreign-born patients (fig. 2). (As used in this report, foreign born applies to patients born outside continental United States, and American born, to patients born within continental United States.)

Most of the patients, 1,204 (82.4 percent), were admitted from the States of New York, Florida, Louisiana, Texas, and California. From Florida, Louisiana, Texas, and California, States in which the disease has been considered endemic, 1,046 (71.6 percent) were admitted. (Although leprosy is no longer held to be endemic in California, for the purpose of this review California is classed as it was in the past.) The majority of the California pa-

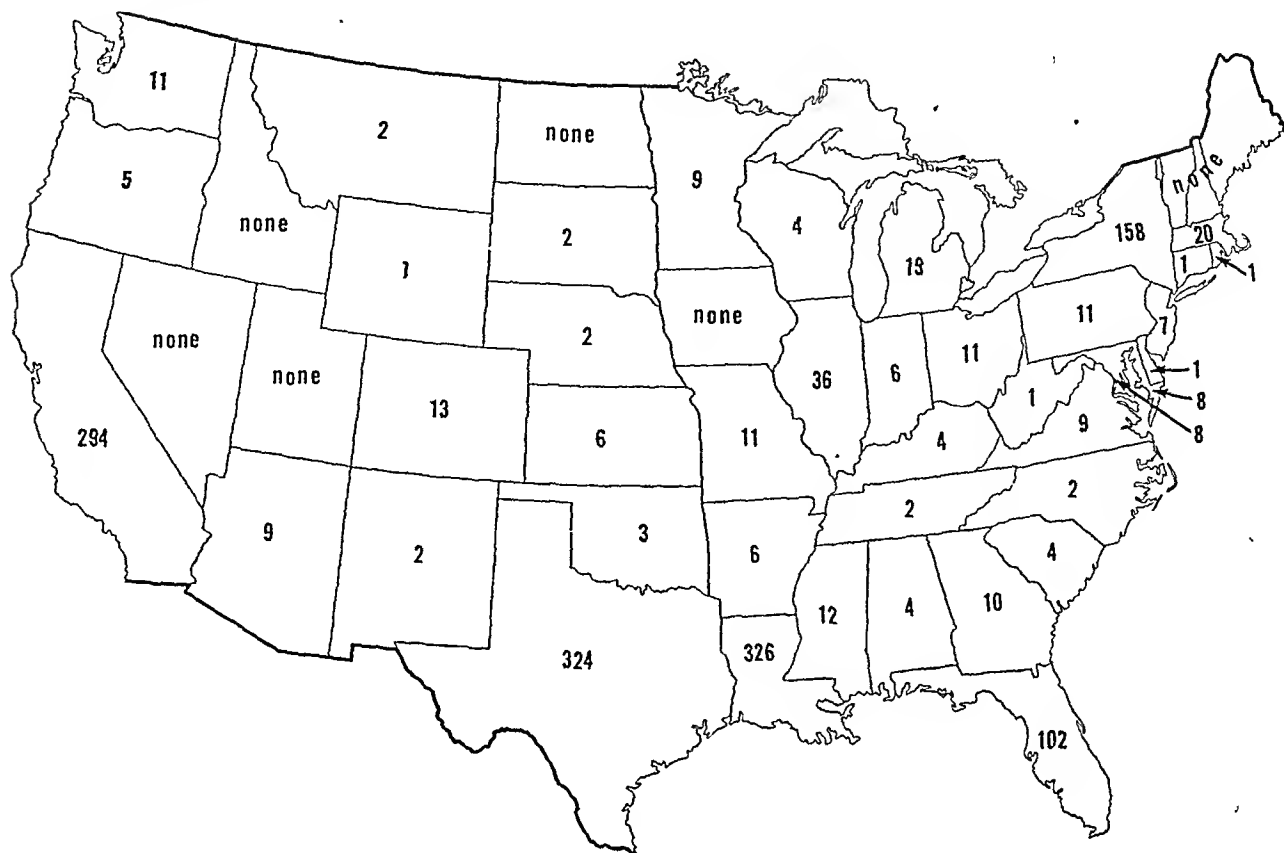
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*Dr. Badger since 1949 has been chief of the Leprosy Control Unit, Communicable Disease Center, Public Health Service, Atlanta, Ga. In most of his assignments during his 24-year career with the Service he has been concerned with leprosy investigation and control work.*

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**Figure 1. States from which patients were admitted to the National Leprosarium, 1921-53.**



tients (80.6 percent) and of the New York patients (89.2 percent) were of foreign birth. The majority of the Florida patients (86.2 percent), of the Louisiana patients (95.4 percent), and of the Texas patients (74.8 percent) were born in the United States (table 1).

From 1940 through 1953, 476 patients were admitted to the leprosarium, as compared to 486 for 1931-40 and 503 for 1921-30. These figures suggest a slight downward trend. The decrease may be attributed in part, however, to the fact that in recent years patients with tuberculoid leprosy have not always been admitted to the leprosarium. The decrease is accounted for largely by a decrease in the number of foreign-born patients.

In addition to the patients admitted to the National Leprosarium, information has been obtained on 355 leprosy patients in the four endemic States who were not admitted. The number of patients in other States who were not admitted is at present unknown. Thus, a total of 1,820 patients were either admitted to the leprosarium or were known to have the dis-

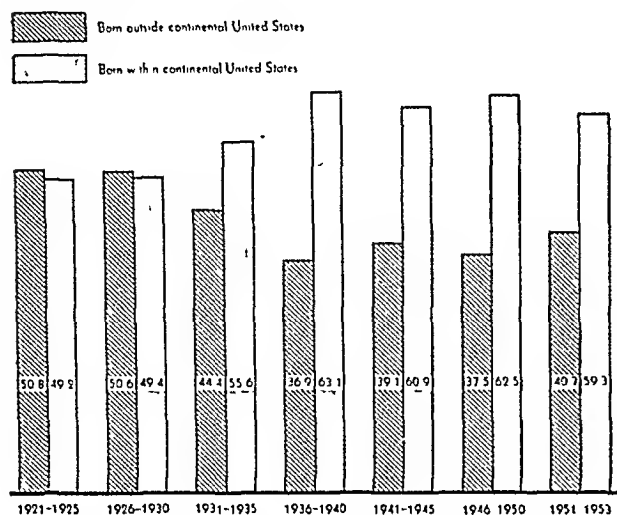
case during the period 1921-53. It is impossible, however, to state with any degree of accuracy the total number of cases that actually occurred during that period.

### Foreign-Born Patients

The 637 foreign-born leprosy patients admitted to the National Leprosarium give an idea of the extent to which leprosy has been imported into the United States in recent years. The majority of these patients probably became infected before they entered this country, and some of them were sources of infection in American-born patients. However, there is reason to believe that some of the foreign-born patients contracted the disease from infected associates after their arrival in the United States, as will be shown later in this paper.

Foreign-born patients have been admitted to the leprosarium from all sections of the country (table 1), and they have come from more than 50 different political entities (table 2). The majority of the foreign-born patients who

**Figure 2. Percentages of National Leprosarium patients of foreign birth and of United States birth, 1921-53.**



appeared in the Atlantic Coast States were born in European countries or the West Indies; of those who appeared in the Gulf Coast States, in the West Indies or Mexico; and of those in the

Pacific Coast States, in Mexico, the Pacific Islands, or Asia.

During the 33-year period, the number of patients of foreign birth declined more than the total number of patients fell. The yearly average number of foreign-born patients dropped from 25.0 during the period 1921-35 to 14.5 during the period 1936-53. There were 30.6 percent fewer foreign-born patients admitted during the second period than during the first. The greatest decrease, 67.7 percent, occurred among European-born patients. Patients native of Asia decreased 34.3 percent, and those native of the West Indies decreased 36.5 percent. Patients born in Puerto Rico, however, increased 100 percent, and those born in Mexico increased 22 percent.

A number of foreign-born persons in whom clinical leprosy developed after their arrival in the United States were not admitted to the leprosarium. In California, for example, 248 cases of leprosy were recognized among persons born in Mexico, but only 100 were admitted.

**Table 1. Birthplace of National Leprosarium patients, according to State from which admitted, 1921-53**

State from which admitted	Continental United States	Foreign countries <sup>1</sup>	Total	State from which admitted	Continental United States	Foreign countries <sup>1</sup>	Total
Alabama.....	4	0	4	Nevada.....	0	0	0
Arizona.....	6	3	9	New Hampshire.....	0	0	0
Arkansas.....	6	0	6	New Jersey.....	1	6	7
California.....	57	237	294	New Mexico.....	0	2	2
Colorado.....	5	8	13	New York.....	17	141	158
Connecticut.....	0	1	1	North Carolina.....	1	1	2
Delaware.....	1	0	1	North Dakota.....	0	0	0
District of Columbia.....	5	3	8	Ohio.....	6	5	11
Florida.....	88	14	102	Oklahoma.....	3	0	3
Georgia.....	8	2	10	Oregon.....	1	4	5
Idaho.....	0	0	0	Pennsylvania.....	3	8	11
Illinois.....	13	23	36	Rhode Island.....	0	1	1
Indiana.....	2	4	6	South Carolina.....	4	0	4
Iowa.....	0	0	0	South Dakota.....	0	2	2
Kansas.....	3	3	6	Tennessee.....	2	0	2
Kentucky.....	2	2	4	Texas.....	241	81	324
Louisiana.....	308	15	326	Utah.....	0	0	0
Maine.....	0	0	0	Vermont.....	0	0	0
Maryland.....	3	5	8	Virginia.....	3	6	9
Massachusetts.....	1	19	20	Washington.....	3	8	11
Michigan.....	0	13	13	West Virginia.....	0	1	1
Minnesota.....	2	7	9	Wisconsin.....	2	2	4
Mississippi.....	10	2	12	Wyoming.....	0	1	1
Missouri.....	6	4	11	Unknown <sup>5</sup> .....	2	2	4
Montana.....	2	0	2				
Nebraska.....	1	1	2				
				Total.....	822	637	1,465

<sup>1</sup> Includes Territories and possessions of the United States. <sup>2</sup> Birthplace of 3 not recorded. <sup>3</sup> Birthplace of 1 not recorded. <sup>4</sup> Birthplace of 2 not recorded. <sup>5</sup> State from which admitted not recorded.

The majority of the remaining 148 apparently returned to Mexico either voluntarily or through deportation procedures.

### American-Born Patients

American-born patients were admitted from 33 States and the District of Columbia (table 1). Ten or more patients were admitted from only 7 States: the 4 endemic States and Illinois, Mississippi, and New York.

Not all of the American-born patients contracted the disease in this country, nor did all of them become infected in the States from which they were admitted. Many became infected while residing in endemic countries, and others, while residing in endemic States.

The number of American-born patients admitted to the leprosarium has been rather constant. The yearly average for 5-year periods from 1921-50 ranged from 22.4 to 31.0, and the yearly average for 1951-53 was 18.0.

### Concentration in States

Leprosy among persons born in the United States is concentrated in Florida, Louisiana, Texas, and, to a lesser extent, California. Of the 820 American-born patients, 740 (90.2 per cent) were either admitted from or born in these four States. A majority of the foreign-born patients were also admitted from these States, most of these, however, from California.

#### Florida

A total of 137 cases of leprosy were recognized among Florida residents during the period 1921-53. Admitted to the leprosarium were 102 of the patients.

Of the 137 patients, 111 were born in the continental United States and 96 were born in Florida. Thus, leprosy in Florida seems primarily to concern Florida-born persons.

Of the 22 patients of foreign birth, 16 were natives of the West Indies—11 of the Bahama Islands and 5 of Cuba. Of the 15 patients born in other States, 1 was a native of Louisiana, and 14 were natives of nonendemic States. (The birthplaces of 4 patients were not recorded.)

**Table 2. Country of birth of foreign-born patients admitted to National Leprosarium, 1921-53**

Country of birth	1921-35	1936-53	Total
<b>Europe</b> .....	<b>93</b>	<b>30</b>	<b>123</b>
Austria.....	1	0	1
Azores.....	1	0	1
Czechoslovakia.....	0	1	1
England.....	0	1	1
Finland.....	3	0	3
France.....	1	1	2
Germany.....	3	2	5
Greece.....	23	4	27
Hungary.....	2	0	2
Italy.....	18	8	26
Latvia.....	0	1	1
Lithuania.....	1	0	1
Norway.....	3	1	4
Palestine <sup>1</sup> .....	3	0	3
Poland.....	1	0	1
Portugal.....	6	0	6
Russia.....	10	3	13
Serbia.....	1	0	1
Spain.....	8	5	13
Sweden.....	1	1	2
Switzerland.....	0	1	1
Syria <sup>1</sup> .....	3	0	3
Turkey.....	4	1	5
<b>Africa</b> .....	<b>5</b>	<b>2</b>	<b>7</b>
Algeria.....	0	1	1
Cape Verde Islands.....	3	0	3
Malta.....	1	1	2
Morocco.....	1	0	1
<b>Asia</b> .....	<b>35</b>	<b>23</b>	<b>58</b>
China.....	28	21	49
India.....	4	1	5
Japan.....	2	0	2
Korea.....	1	1	2
<b>Pacific Islands</b> .....	<b>68</b>	<b>41</b>	<b>109</b>
Hawaiian Islands.....	16	10	26
Philippine Islands.....	49	29	78
Samoa (American).....	0	2	2
Tahiti.....	3	0	3
<b>North America</b> .....	<b>104</b>	<b>123</b>	<b>127</b>
Canada.....	4	1	5
Mexico.....	100	122	222
<b>Central and South America</b> .....	<b>19</b>	<b>9</b>	<b>28</b>
Argentina.....	1	0	1
Brazil.....	3	1	4
British Guiana.....	5	1	6
Canal Zone.....	1	0	1
Central America <sup>2</sup> .....	1	0	1
Chile.....	0	1	1
Colombia.....	1	3	4
Costa Rica.....	1	0	1
Dutch Guiana.....	4	2	6
Panama.....	1	1	2
Venezuela.....	1	0	1
<b>West Indies</b> .....	<b>52</b>	<b>33</b>	<b>85</b>
British West Indies.....	27	6	33
Cuba.....	7	3	10
Puerto Rico.....	11	22	33
Virgin Islands.....	5	2	7
Island not designated.....	2	0	2
<b>Total</b> .....	<b>376</b>	<b>261</b>	<b>637</b>

<sup>1</sup> Included with European countries because of its proximity.

<sup>2</sup> Country not indicated.

As shown by the following tabulation, there appears to be a slight downward trend in the number of patients native of the State:

	Number	Yearly average
1921-30_____	33	3.3
1931-40_____	31	3.1
1940-50_____	28	2.8
1951-53_____	4	1.3

### Louisiana

Leprosy was first recorded in Louisiana in 1766-68, when cases occurring among the French were isolated at Balize at the mouth of the Mississippi River (2). In 1785, a hospital was established in New Orleans for the treatment of persons afflicted with the disease, and in 1894, the Louisiana Home for Lepers was established near the village of Carville. In 1921, this institution was acquired by the Federal Government and became the National Leprosarium.

Both the West Indies and Canada have been considered as sources of leprosy in Louisiana. According to Dyer (3), "The popular impression . . . that leprosy in Louisiana came with the Acadians from Nova Scotia . . . was due, no doubt, to the fact that among the descendants of these people leprosy has existed, but the evidence seems to point to the fact that the disease came rather through the West Indies, particularly Martinique . . . and Cuba."

From 1921 through 1953, 350 cases of leprosy were recognized in the State, and 326 of the patients were admitted to the National Leprosarium.

As in Florida, leprosy in Louisiana is primarily a problem in persons born within the State: 313 of the 350 patients were born in Louisiana. Of the 18 patients born in other States, 6 were natives of Texas, 1 was born in California, and the remainder were natives of nonendemic States. Of the 15 foreign-born patients, 1 was born in Canada, 3 in Mexico, 1 in South America, and the remainder in Europe. (The birthplaces of 4 patients were not recorded.)

The trend in Louisiana-born patients also appears to be downward, as shown by the data below. There were 45.6 percent fewer cases

recognized during the period 1941-50 than during the period 1921-30.

	Number	Yearly average
1921-30_____	125	12.5
1931-40_____	109	10.9
1941-50_____	68	6.8
1951-53_____	11	3.6

### Texas

In Texas, 393 cases of leprosy were recognized during the 33-year period. Of these patients, 324 were admitted to the National Leprosarium.

Information concerning the origins of the 69 patients not admitted to the leprosarium is unavailable. Of the 324 admitted, 241 were born within the continental United States, and of these, 202 were born in Texas and 17 in the adjoining endemic State of Louisiana. Of the 81 foreign-born patients, 77 were natives of Mexico. Thus, leprosy here concerns primarily natives of Texas, Mexico, and Louisiana.

The fact that rather large numbers of Texas patients were born in Mexico or Louisiana indicates that the disease in these areas is related. Further evidence is found in these facts: Of the 202 Texas-born patients, 39 had Mexican-born parents; 32 had one parent of Mexican birth; and 5 had one parent born in Louisiana.

The majority of the 39 Texas patients born in other States probably became infected after they entered Texas. Of 20 patients born in nonendemic States, 11 had lived only in these States prior to entering Texas. They entered Texas at ages ranging from 6 to 44 years, and experienced onset of the disease in from 7 to 51 years. Seven of the 20 had lived also in other endemic areas. Of the 17 Louisiana-born patients, 11 had lived only in that State but had had no known contact with the disease. When they moved, their ages ranged from early infancy to 69 years, and the onset of the disease occurred in from 2 to 56 years. One Louisiana-born patient experienced onset of the disease before he left that State; another had had contact with an infected relative; and three had lived also in endemic countries. Of 2 California-born patients, one experienced onset of the disease before leaving that State. (Histories for 4 of the 39 patients were incomplete.)

The number of Texas-born patients admitted

to the National Leprosarium has been rather constant.

	Number	Yearly average
1921-25-----	8	1.6
1926-30-----	20	4.0
1931-35-----	44	8.8
1936-40-----	33	6.6
1941-45-----	34	6.8
1946-50-----	41	8.8
1951-53-----	19	6.3

California

Cases of leprosy recognized in California numbered 521. A few more than half of the patients, 294, were admitted to the National Leprosarium. Of the 103 admissions during the period 1921-30, 31 occurred in 1922. Prior to 1921, California had its own leprosarium, and undoubtedly many of the patients admitted in 1922 had previously been hospitalized in that institution.

Leprosy in California is primarily a disease of the foreign-born. Of the 521 patients, 436 were of foreign birth, 41 were born in other States, and only 34 were born in California. (The birthplaces of 10 patients are not known.)

*Foreign-born patients.* The birthplaces of the foreign-born patients reflect the immigration pattern of the State: 394 of the patients were born in the Orient, the islands of the Pacific, or Mexico. The greatest number, 248, were natives of Mexico.

Although most of the foreign-born patients probably became infected before they entered this country, it seems likely that a number of them contracted the disease after entry through contact with infected associates. This opinion is supported by the following data for Mexican-born and Philippine-born patients on elapsed time between entry into the State and onset of the disease (patients who had experienced onset of the disease prior to leaving Mexico not included):

Elapsed time (years)	Mexicans: 91 (percent)	Filipinos: 40 (percent)
Less than 10-----	30.7	82.5
Less than 15-----	57.1	87.5
More than 15-----	42.8	12.5
More than 20-----	29.6	2.5

If it should be assumed that each of these patients became infected before entering the

United States, it must be assumed also that the incubation period, for some reason, was of much longer duration among the Mexicans than among the Filipinos. There are, however, two other possible explanations for the difference:

1. Many of the Mexicans may have become infected during visits to Mexico subsequent to their initial entry into the United States. Histories of such visits have been obtained for some of the patients. The Filipinos, on the other hand, are less likely to have made frequent visits to the islands of their birth.

2. Some of the Mexican-born patients may have become infected in California, where there was ample opportunity for contact with infectious cases.

The difference in the length of time between entry and onset is not because the Filipinos were younger than the Mexicans when they migrated to the State. In fact, the Filipinos were slightly older than the Mexicans, as shown by the following tabulation:

Age (years)	Mexicans (percent)	Filipinos (percent)
Under 10-----	10.9	2.2
Under 15-----	23.0	11.1
Under 20-----	46.1	37.7
Over 20-----	53.8	62.2

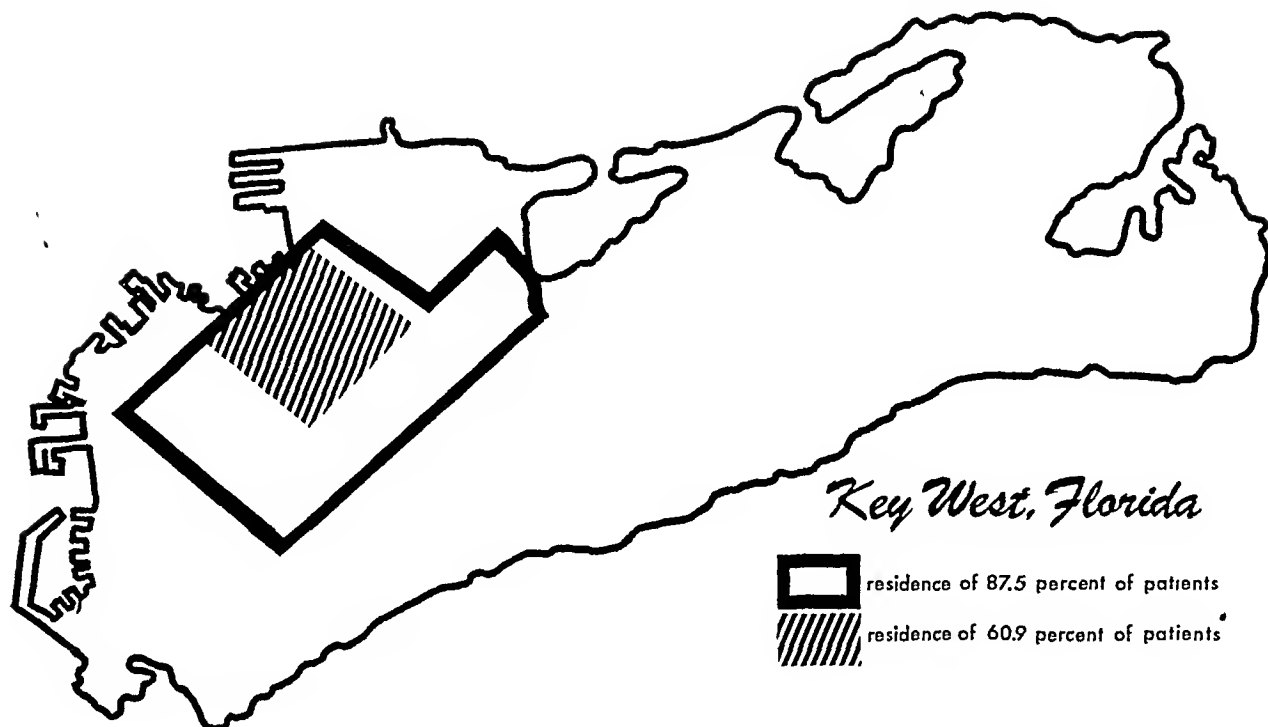
The possibility that some of the Mexican-born patients in California contracted the disease after entry is further supported by the fact that the elapsed time between entry and onset for Mexicans admitted from California was considerably longer than the elapsed time for Mexicans admitted from nonendemic States, as shown below:

Elapsed time (years)	California: 91 (percent)	Nonendemic States: 37 (percent)
Less than 10-----	30.7	64.8
Less than 15-----	57.1	81.0
More than 10-----	42.8	35.1
More than 15-----	29.6	18.9

*American-born patients.* The majority of the American-born patients in California probably became infected elsewhere, but a few may have contracted the disease in the State.

Of 34 patients born in California, 16 gave no history of having lived outside the State and may be assumed to have become infected in the State. Six of these 16 had had contact with cases in the family.

Figure 3. Concentration of leprosy in Key West, Fla., 1921-53.



Of the 30 patients born in nonendemic States, 10 had not lived in an endemic State or country before entering California. One of these 10 had lived in Wisconsin, Oregon, and Washington. Six had lived only in Arizona, but onset of the disease occurred in 1 before he left that State, and in 2 others 4 to 6 years after they left. One had lived only in Ohio and Illinois, and one had lived only in Minnesota. The tenth had been a merchant seaman, visiting many ports in endemic countries, and experienced onset of the disease 6 years after he settled in California.

At least 6 of the 11 patients born in endemic States other than California probably became infected before they entered the State.

#### Concentration in Limited Areas

Not only is leprosy confined largely to a few States in this country, it is also confined to a limited area in each of these States.

In Florida, cases were recognized among residents of only 11 of the 67 counties during the 33-year period, and among residents of only 8 counties during the last 10 years of that period.

The disease has been concentrated in one county, Monroe, and within this county, in Key

West. Of the 137 cases in the State, 44.5 percent were recognized in Monroe County. Of the 96 Florida-born patients, 44.5 percent resided in Key West at the time of diagnosis. Moreover, case histories for 94 Florida-born patients indicate that 78 of these patients probably contracted the disease in Key West.

Within Key West, the disease has been concentrated in a restricted section of the city. Of the 65 patients residing in the city while the disease was active, 56 lived within the outlined area on the map in figure 3, and 39 lived within the shaded area, an area about 5 blocks square. (The address of one patient was not determined.)

In Louisiana, the disease has been concentrated in the lower half of the State. Of the total of 350 patients, 95.1 percent resided in this section: 71.7 percent, in the 9 parishes in the southeastern part of the State; and 46 percent, in Orleans Parish. Cases have been recognized in 27 of the 35 parishes in the southern half of the State, but in only 4 of the 29 in the northern half.

The disease in Texas has been concentrated in the southeastern part of the State. Patients were admitted to the National Leprosarium

from only 53 of the 254 counties. More than 10 patients were admitted from only 7 counties; the patients from these 7 counties represented 68.2 percent of the total from the State. Only 1 patient was admitted from each of 23 other counties.

The 521 patients in California resided in 33 of the 58 counties when they were admitted to the leprosarium or when the disease was recognized. Ten or more patients resided in 11 of the counties, and 293 patients lived in San Francisco or Los Angeles County. There has not been as definite a concentration of cases in limited areas in California as in the other endemic States, but, as noted previously, many of the California patients apparently were infected outside the State.

This concentration of leprosy in limited areas is important because in many instances it is related to the possible source of infection. Particularly is this true in the consideration of the source of infection in members of the armed forces. There is a tendency to consider the source of infection of a serviceman who was born in or had lived in one of the endemic States as that State regardless of whether or not he later spent time in another endemic State or in an endemic country. Actually, if he had lived only in the northwestern part of Texas, for example, his opportunity for becoming infected was no greater than if he had lived in Colorado or Oklahoma.

**Dispersion From Endemic States**

Leprosy in the endemic States is also important as it relates to the disease in the non-endemic States. Forty-six patients born in the endemic States were admitted from 19 nonendemic States and the District of Columbia (fig. 4). Eight were born in Florida; 14 in Louisiana; 15 in Texas; and 9 in California.

The majority of these 46 patients probably became infected before they left their State of birth, and in some instances they have been sources of infection in persons living in non-endemic States. In 16 of the patients, the disease had become clinically manifest before they left their State of birth. Another 4 patients entered the armed services directly from the State of birth, and in each of these the onset

occurred within 2 years after they entered the service.

Eleven patients had lived only in nonendemic States after they left their State of birth and before the disease became manifest. In 4 of these the onset of the disease occurred within 4 years after they left their State of birth; in 8, within 15 years; and in 3, after more than 15 years.

From the histories of 7 of the 46 patients, it seems likely that they became infected while in foreign countries: Three had served as members of the armed forces in the Philippine Islands; two had lived in China; one in Japan; and one in Hawaii. The histories of the remaining 8 patients are insufficient for analysis.

**Nonendemic States**

During the period 1921-53, 415 patients were admitted to the National Leprosarium from 36 nonendemic States and the District of Columbia. Of these, 288 were born outside continental United States and 126 were natives of the United States. (The birthplace of one is not known.)

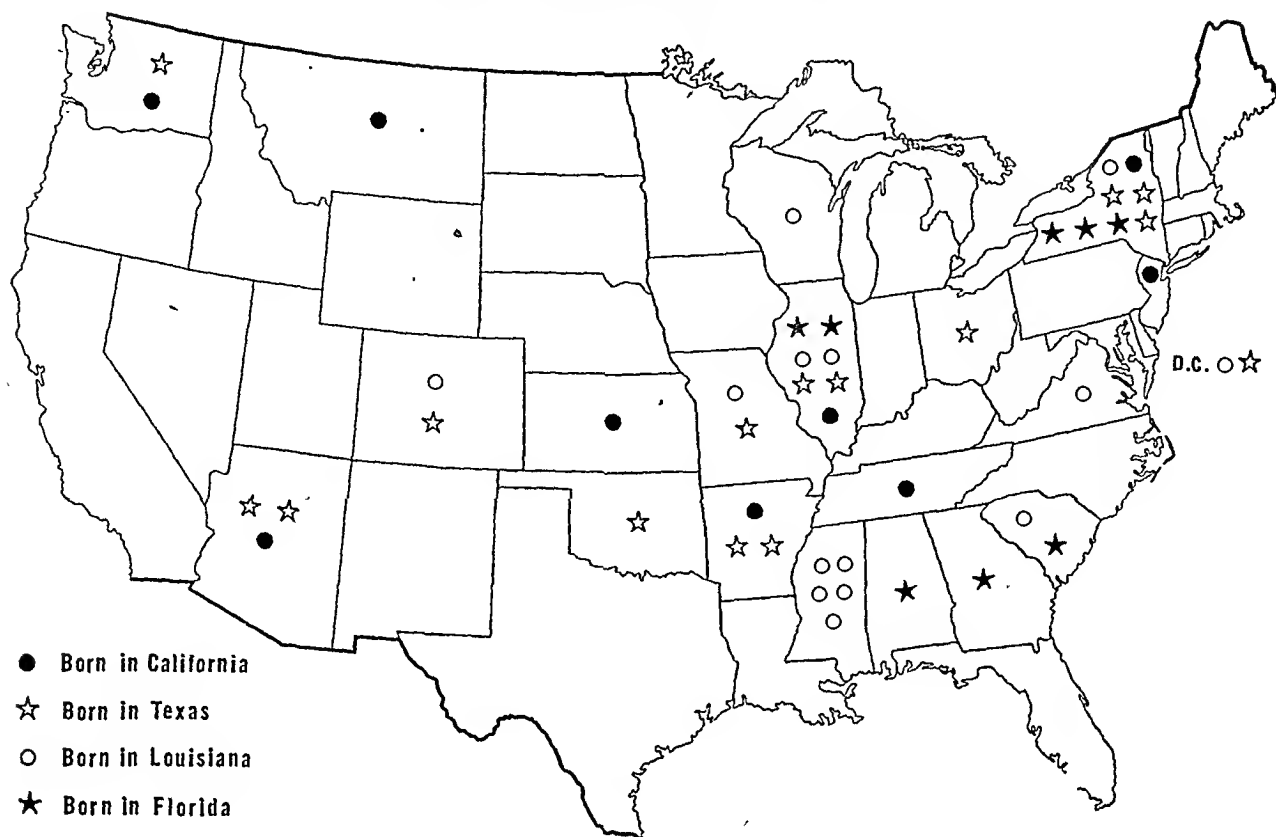
Of the foreign-born patients, 140 were admitted from New York State and 148 were admitted from 28 other nonendemic States and the District of Columbia. The greatest number of the foreign-born patients were natives of Mexico, and the next greatest number were natives of the West Indies.

The 126 American-born patients, who were admitted from 29 nonendemic States and the District of Columbia, may be categorized as follows:

Born in endemic States.....	46
Born in nonendemic States, resided in endemic areas prior to onset of disease.....	20
Born in nonendemic States, visited or traveled in endemic areas prior to onset of disease.....	6
Born in nonendemic States, served as members of armed forces in endemic areas prior to onset of disease.....	18
Born in nonendemic States, resided only in non-endemic States.....	33
Incomplete history.....	3

The majority of these patients had opportunities for becoming infected while in an endemic State or foreign country. The 46 pa-

Figure 4. Nonendemic States from which patients born in endemic States were admitted to the National Leprosarium, 1921-53.



tients born in endemic States have already been discussed. In several of the 20 who lived in endemic areas sometime after birth, the onset of the disease occurred before they left the area, and in others, shortly afterward. The 18 patients who had served in endemic areas as members of the armed forces experienced onset of the disease in from 1 to 13 years after such duty: In 9, the onset occurred within 5 years; in 15, within 10 years; and in 17, within 15 years (date of onset not given for 1 patient).

If the histories of the 33 patients who specified that they had never lived or visited in an endemic area are correct, it must be assumed that they became infected while living in nonendemic States. Nine of them gave definite histories of contact with known cases of leprosy in the nonendemic State. The possibility exists, of course, that some of the patients had visited in endemic areas but failed to give such information to the interviewers.

A majority of families in the United States in which the disease is recognized are single-

case families, and the sources of infection are apparently extrafamilial infectious cases. With such low prevalence of the disease in the nonendemic States, it is not surprising that so few cases have occurred. Undoubtedly, if there were areas in these States in which the disease was concentrated as it is in the endemic States, more cases would occur.

Of the patients who had never lived in an endemic State, the number who had lived only in northern States is about the same as the number who at some time had lived in the southern States. This strongly indicates that, providing there is ample opportunity for contact with the disease, it would occur in any part of the country, north or south.

#### New York State

The leprosy situation in New York is unique in that, although the disease is not endemic, a large number of patients have been admitted from the State.



The reporting of leprosy is not required in New York State, although it is in New York City. Persons with the disease are not always admitted to the National Leprosarium. Occasionally, persons residing in endemic States move to New York when they learn that they have the disease, and a few patients have absconded from the leprosarium to that State. Information on many of these persons, however, is insufficient for analysis; the following discussion therefore relates only to patients originally admitted to the leprosarium from New York.

Of the 158 patients admitted from New York, 140 were of foreign birth and only 18 were born within continental United States. Of the latter, only 2 were born in New York.

From the available information concerning the American-born patients, the majority probably became infected before entering the State. One patient, however, almost certainly became infected in the State. He had lived in New York City until the age of 42 years (1923), when he visited in Italy for 3 months. On his return the disease was recognized, and he was sent to the leprosarium from the Immigration Station. The onset of the disease had occurred in 1921. Another patient may have become infected in New York. Born in Tampa, this patient moved to New York at the age of 6 years. There he lived with his aunt, who had moved to New York from Florida a year after she developed clinical manifestations of leprosy. The aunt was admitted to the leprosarium 6 years after moving to New York, and 9 years later onset of the disease occurred in the nephew.

Of the foreign-born patients, the greatest number, 59, were natives of the islands of the West Indies, and the next greatest number, 34, were natives of the countries of Europe. As in California, it seems likely that some of the foreign-born patients in New York contracted the disease after entry into this country. With 158 patients admitted to the leprosarium and many more not admitted, there has been ample opportunity for contact with infectious cases within the State. Nearly one-half (47.4) of the patients admitted were admitted more than 5 years after the onset of the disease; 17.5 percent, more than 10 years after onset. As shown

in the following tabulation, the length of time between entry into this country and onset of the disease was considerably longer for European-born patients than for patients born in the West Indies:

<i>Elapsed time (years)</i>	<i>Europeans: 24 (percent)</i>	<i>West Indians: 35 (percent)</i>
Less than 10.....	33.3	82.8
Less than 15.....	66.6	94.2
More than 15.....	33.3	5.7
More than 20.....	25.0	2.8
More than 30.....	8.3	0

Based only on the number of admissions to the leprosarium, the trend of the disease in New York is downward. There were 51 percent fewer patients admitted during the period 1936-53 than during the period 1921-35. Patients of European birth decreased 82.7 percent, and those of West Indian birth, 15.6 percent. Although the number of patients from Puerto Rico is small, patients native of this island increased 70 percent. Whether the apparent downward trend is actual or due to a decrease in the admission of recognized patients is not known.

### Summary

Leprosy in the United States is a definite, though not a great, public health problem. The disease may occur in, and be transmitted in, any section of the country. Although a large proportion of the recognized cases have occurred in persons of foreign birth, a majority have occurred in natives of the United States. It must not be assumed, however, that all the patients of foreign birth became infected before entry into the United States, although a majority probably did. In the majority of American-born patients, the disease was contracted in this country.

A majority of the cases have occurred among residents of New York, Florida, Louisiana, Texas, and California, and most of the American-born patients have been natives of Florida, Louisiana, or Texas. The disease has been concentrated in restricted areas of Florida, Louisiana, Texas, and California. A number of patients recognized in the nonendemic States became infected in the endemic States.

## REFERENCES

- (1) Romans, B.: Concise natural history of East and West Florida. Printed for the author in New York, 1775.
- (2) Denny, O. E.: Leprosy in the southern United States. South. M. J. 26: 763-68 (1933).
- (3) U. S. Congress. Senate Committee on Public Health: Care and treatment of persons afflicted with leprosy. Report of the Committee [on Public Health], 64th Cong., 1st Sess. Washington, D. C., U. S. Government Printing Office, 1916, p. 13.

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## International Conference on Arid Lands

The need for a unified research approach to problems of water supply and food production in areas where water is scarce was stressed at the International Symposium and Conference on the Future of Our Arid Lands.

The meetings, held at Albuquerque and Socorro, N. Mex., from April 26 to May 4, 1955, were sponsored by the American Association for the Advancement of Science and its Southwestern and Rocky Mountain Division and were supported by the National Science Foundation, the Rockefeller Foundation, and the United Nations Educational, Scientific, and Cultural Organization.

Col. Omar Draz of the Egyptian Army Veterinary Corps, director, desert range development project, Desert Institute, Heliopolis, Egypt, in his address on the adaptation of plants and animals to arid conditions said, "The growing world population, together with the need to raise the standard of living for millions of people who suffer hunger or malnutrition, makes the increase of the world food production an urgent and vital requirement."

The symposium consisted of four technical sessions on: variability and predictability of water supply in arid regions; improved use of present resources; prospects for additional water sources, including questions on the practicability of weather control, demineralizing saline water, and re-using waste waters; and adaptation of plants and animals to arid conditions.

The American Association for the Advancement of Science will publish the symposium papers and specific recommendations of the conference. Further information may be obtained from John A. Behnke, Associate Administrative Secretary, American Association for the Advancement of Science, 1025 Connecticut Avenue, N. W., Washington 6, D. C.

The reporting of leprosy is not required in New York State, although it is in New York City. Persons with the disease are not always admitted to the National Leprosarium. Occasionally, persons residing in endemic States move to New York when they learn that they have the disease, and a few patients have absconded from the leprosarium to that State. Information on many of these persons, however, is insufficient for analysis; the following discussion therefore relates only to patients originally admitted to the leprosarium from New York.

Of the 158 patients admitted from New York, 140 were of foreign birth and only 18 were born within continental United States. Of the latter, only 2 were born in New York.

From the available information concerning the American-born patients, the majority probably became infected before entering the State. One patient, however, almost certainly became infected in the State. He had lived in New York City until the age of 42 years (1923), when he visited in Italy for 3 months. On his return the disease was recognized, and he was sent to the leprosarium from the Immigration Station. The onset of the disease had occurred in 1921. Another patient may have become infected in New York. Born in Tampa, this patient moved to New York at the age of 6 years. There he lived with his aunt, who had moved to New York from Florida a year after she developed clinical manifestations of leprosy. The aunt was admitted to the leprosarium 6 years after moving to New York, and 9 years later onset of the disease occurred in the nephew.

Of the foreign-born patients, the greatest number, 59, were natives of the islands of the West Indies, and the next greatest number, 34, were natives of the countries of Europe. As in California, it seems likely that some of the foreign-born patients in New York contracted the disease after entry into this country. With 158 patients admitted to the leprosarium and many more not admitted, there has been ample opportunity for contact with infectious cases within the State. Nearly one-half (47.4) of the patients admitted were admitted more than 5 years after the onset of the disease; 17.5 percent, more than 10 years after onset. As shown

in the following tabulation, the length of time between entry into this country and onset of the disease was considerably longer for European-born patients than for patients born in the West Indies:

<i>Elapsed time (years)</i>	<i>Europeans: 24 (percent)</i>	<i>West Indians: 35 (percent)</i>
Less than 10-----	33.3	82.8
Less than 15-----	66.6	94.2
More than 15-----	33.3	5.7
More than 20-----	25.0	2.8
More than 30-----	8.3	0

Based only on the number of admissions to the leprosarium, the trend of the disease in New York is downward. There were 51 percent fewer patients admitted during the period 1936-53 than during the period 1921-35. Patients of European birth decreased 82.7 percent, and those of West Indian birth, 15.6 percent. Although the number of patients from Puerto Rico is small, patients native of this island increased 70 percent. Whether the apparent downward trend is actual or due to a decrease in the admission of recognized patients is not known.

### Summary

Leprosy in the United States is a definite, though not a great, public health problem. The disease may occur in, and be transmitted in, any section of the country. Although a large proportion of the recognized cases have occurred in persons of foreign birth, a majority have occurred in natives of the United States. It must not be assumed, however, that all the patients of foreign birth became infected before entry into the United States, although a majority probably did. In the majority of American-born patients, the disease was contracted in this country.

A majority of the cases have occurred among residents of New York, Florida, Louisiana, Texas, and California, and most of the American-born patients have been natives of Florida, Louisiana, or Texas. The disease has been concentrated in restricted areas of Florida, Louisiana, Texas, and California. A number of patients recognized in the nonendemic States became infected in the endemic States.

A large number of persons were affected in outbreaks following attendance at picnics and similar social gatherings, but this may possibly be a reflection of the numbers who attended, as well as increased opportunities for consumption of food exposed at temperatures favorable for bacterial growth. Outbreaks following church socials included the familiar story of a typhoid fever epidemic following a church supper.

The number of outbreaks in summer camps was not large since all of them were reported by two States. None of the more serious types of foodborne or waterborne diseases, such as shigellosis, salmonellosis, and typhoid fever, were reported in this group in 1954. Outbreaks in labor camps were also few in number, possibly because such groups are not as numerous as some of the others listed.

The small number of outbreaks among passengers on trains, airplanes, or ships may be due in part to under-reporting since many patrons of dining services on trains and airplanes would have reached their destinations and would have scattered before onset of symptoms. On the other hand, the small number of outbreaks may also be a reflection of the attention given to dining car sanitation on trains and supervision of

food services on other interstate carriers (2). No outbreak was reported among patrons of railway dining cars, although one did occur among members of a dining car crew.

The outbreaks listed under the category of communities consist of those in which there was distribution of infected foods from bakeries and other retail stores to various persons in a community. They also include those in which polluted water caused illness in a community.

### Waterborne Disease Outbreaks

In 1954, only four outbreaks were reported in which there was good evidence that water was the vehicle of infection. There were also three other outbreaks in which water was suspected as the source of infection.

One of the four waterborne outbreaks was typhoid fever in a coal mining village where water was pumped from a worked-out section of a mine into the distributing system of the town. Two outbreaks of gastroenteritis were reported. One was explosive and followed contamination of the water supply after heavy rains; the other occurred in a recreational area where untreated well water was used.

Table 1. Certain foodborne and waterborne disease outbreaks,<sup>1</sup> by type of population, 1954

Type of population	Staphylococcal food poisoning			Shigellosis			Salmonellosis <sup>2</sup>			Typhoid fever <sup>2</sup>			Other types gastroenteritis		
	Number States reporting	Number outbreaks	Number cases reported	Number States reporting	Number outbreaks	Number cases reported	Number States reporting	Number outbreaks	Number cases reported	Number States reporting	Number outbreaks	Number cases reported	Number States reporting	Number outbreaks	Number cases reported
Public and private schools.....	5	5	309	7	9	945	2	2	157	1	1	21	5	9	824
Colleges.....	1	1	469	---	---	---	1	1	16	---	---	---	4	5	252
Households.....	6	21	93	---	---	---	4	8	91	6	12	38	6	19	129
Church socials.....	2	4	102	---	---	---	2	2	440	1	1	12	2	2	98
Restaurants and hotels.....	9	19	278	---	---	---	4	5	107	---	---	---	4	14	312
Private clubs and dining halls.....	8	12	1,020	---	---	---	3	3	106	---	---	---	6	6	285
Picnics.....	5	11	1,564	---	---	---	---	---	---	---	---	---	3	4	1,235
Summer camps.....	1	2	111	---	---	---	---	---	---	---	---	---	1	7	311
Labor camps.....	1	2	92	1	1	15	---	---	---	---	---	---	3	6	376
Hospitals.....	4	4	208	1	1	57	2	3	68	---	---	---	3	4	226
Institutions.....	2	3	92	1	1	15	1	1	32	1	1	7	2	2	110
Common carriers.....	---	4	203	---	---	---	---	---	---	---	---	---	---	1	10
Communities.....	6	10	165	---	---	---	2	2	116	1	1	9	2	6	428

<sup>1</sup> Outbreaks on military establishments excluded.

<sup>2</sup> Includes single-case family occurrences.

Other outbreaks suspected of being waterborne included three of gastroenteritis following consumption of water of doubtful sanitary quality. Single cases of typhoid fever were also reported in which it was found that infection followed the use of water from wells. However, these are not included in table 2. Thirteen cases of gastroenteritis were reported among members of a basketball team who drank water from a school well which, on examination, was found to be polluted.

#### Milkborne Disease Outbreaks

The number of outbreaks in which there was definite evidence that milk or a milk product was the vehicle of infection was not large. In one instance, four persons in a family developed brucellosis after drinking raw milk from a cow that had aborted. The source of infection of six cases of typhoid fever in two families was traced to raw milk from a dairy farm where a carrier was found handling the milk. An outbreak of salmonellosis followed the consumption of eggnog in an institution. The person who prepared the eggnog was found to be a carrier of *Salmonella typhimurium*, the same organism that was recovered from the patients. Another outbreak in a hospital in which *S. typhimurium* was isolated followed the consumption of a food in which cheese was an ingredient. A group of five persons became ill with staphylococcal food poisoning following the consumption of ice cream. The chef who prepared the ice cream harbored *Staphylococcus aureus* in his throat, and he also had chronic paronychia on all fingers of both hands.

Nine persons in a family outbreak developed gastroenteritis after eating a food containing a cream cheese from which a gram-positive coccus was isolated. A staphylococcal food poison outbreak of about 100 cases was traced to ice cream. The ice cream mix had been allowed to stand at room temperature for several hours prior to freezing. Several cases of tuberculosis in children followed the consumption of milk from herds of cattle, in one of which 80 per cent were found to be tuberculin reactors.

Four outbreaks were reported in which milk

Table 2. Foodborne and waterborne disease outbreaks reported in 1954 by vehicle of infection

Area	Water		Milk and milk products		Other foods	
	Outbreaks	Cases	Outbreaks	Cases	Outbreaks	Cases
United States.....	7	452	9	200	234	11,704
New England:						
Maine.....					2	11
New Hampshire.....					2	111
Vermont.....						
Massachusetts.....					5	202
Rhode Island.....					1	159
Connecticut.....					2	150
Middle Atlantic:						
New York.....	2	50	1	42	33	1,634
New Jersey.....						
Pennsylvania.....					3	22
East North Central:						
Ohio.....					3	176
Indiana.....					11	909
Illinois.....					17	1,442
Michigan.....			1	8		
Wisconsin.....					2	24
West North Central:						
Minnesota.....					2	100
Iowa.....					1	50
Missouri.....						
Kansas.....					3	458
South Atlantic:						
Maryland.....					5	210
District of Columbia.....					1	32
Virginia.....					4	622
West Virginia.....	1	9	1	6	1	3
North Carolina.....					8	525
Florida.....					5	286
East South Central:						
Kentucky.....	1	13			2	93
Tennessee.....	1	180			7	1,689
West South Central:						
Arkansas.....					2	70
Louisiana.....					1	74
Texas.....					1	500
Mountain:						
Montana.....					1	15
Colorado.....					1	2
New Mexico.....					1	35
Utah.....					1	27
Nevada.....					1	3
Pacific:						
Washington.....			1	4	8	149
Oregon.....			1	20	7	29
California.....	2	200	3	20	86	1,609
Alaska.....					1	26
Hawaii.....					3	257
Puerto Rico.....			1	100		

Table 3. Foodborne, waterborne, and other disease outbreaks by type of infection, reported in 1954

Area	Typhoid fever		Salmonellosis		Shigellosis		Trichinosis		Botulism		Staphylococcal food poisoning		Gastroenteritis		Toxic agents and toxic foods	
	Outbreaks	Cases	Outbreaks	Cases	Outbreaks	Cases	Outbreaks	Cases	Outbreaks	Cases	Outbreaks	Cases	Outbreaks	Cases	Outbreaks	Cases
United States...	16	92	26	1,164	19	1,471	6	53	8	18	100	4,868	103	5,914	10	279
New England:																
Maine.....							1	6					1	5		
New Hampshire.....											2	111				
Vermont.....					1	60										
Massachusetts.....			1	16							3	86	2	159		
Rhode Island.....													1	159		
Connecticut.....			1	50							1	100				
Middle Atlantic:																
New York.....			3	123	6	201					12	531	26	1,399	3	27
New Jersey.....																
Pennsylvania.....							2	17			1	5				
East North Central:																
Ohio.....	1	7	1	20	1	150	1	6								
Indiana.....	1	4	1	26	2	198			1	2	3	8	6	762		
Illinois.....	1	5	3	233	2	264					9	451	4	494		
Michigan.....																
Wisconsin.....							1	17			1	7				
West North Central:																
Minnesota.....			2	40	1	15							1	68		
Iowa.....											1	50				
Missouri.....	1	5														
Kansas.....			1	350							1	57	1	51		
South Atlantic:																
Maryland.....									1	2	1	135	3	73		
District of Columbia.....	1	2									1	32				
Virginia.....											2	569	2	53		
West Virginia.....	2	15									1	3				
North Carolina.....	1	8									3	425	6	300		
Florida.....											3	230	2	56		
East South Central:																
Kentucky.....											2	93	1	13		
Tennessee.....	1	21			2	287					3	556	2	1,005		
West South Central:																
Arkansas.....											1	39	1	31		
Louisiana.....											1	74			1	160
Texas.....											1	500				
Mountain:																
Montana.....			1	15												
Colorado.....									1	2						
New Mexico.....											1	35				
Utah.....													1	27		
Nevada.....									1	3						
Pacific:																
Washington.....	4	8	1	21	1	15	1	7	1	2	3	80	2	39		
Oregon.....			1	20	1	7			1	1	4	13			1	8
California.....	3	17	9	150	2	274			2	6	36	452	41	1,220	4	27
Alaska.....											1	26				
Hawaii.....			1	100							1	100			1	57
Puerto Rico.....											1	100				

NOTE: Includes outbreaks reported on military installations. Includes outbreaks not shown in table 1.

season when these shellfish are known to contain toxic substances.

Two cases of poisoning were reported following consumption of tree tobacco (*Nicotiana glauca*).

Three outbreaks of chemical poisoning were reported. One outbreak of 160 cases followed the drinking of an acid fruit juice which had been stored overnight in a galvanized container. Another outbreak followed consumption of a soft drink which, on laboratory examination, revealed the presence of arsenic. Parathion poisoning in 10 laborers living in a migrant labor camp was suspected. One patient had signs of central nervous system involvement, but normal cholinesterase blood levels were found in all patients.

### Trichinosis

Six outbreaks of trichinosis were reported in 1954 as compared with the 13 for 1953. The total (53) cases for 1954 was also similar to that (40) reported in 1952. In 1953, one large outbreak associated with infected hogs accounted for 73 cases, while the largest outbreak in 1954 involved 17 persons who ate sausage from two infected hogs which had been butchered by a friend. Three other outbreaks in 1954 were associated with pork products, and one was from the ingestion of bear meat. In one instance, grain fed hogs were implicated. The source of the infection was probably rats observed on the farm where the meat was obtained. In one State, some meat markets were found to be grinding beef without adequately cleaning grinders after grinding pork products. This practice may have resulted in at least one case. In each of the five outbreaks reported in 1954, examination of meat specimens revealed the presence of *Trichinella*.

### Gastroenteritis

In 63 of the 103 outbreaks of gastroenteritis reported in 1954, there was not sufficient information from epidemiological reports to classify the etiological agent. For more than half of these, no food was available for laboratory tests, and for a large number no pathogens were isolated from the suspected food. For a few, no

bacteriological examinations were performed. Five of these outbreaks were probably of viral origin and may have been spread by person-to-person contact. An additional 13 outbreaks involving 489 cases were associated with various organisms. In three outbreaks, streptococci were isolated, and in a few, gram-positive cocci were isolated. In other outbreaks enterococci, *Escherichia coli*, paracolon and proteus organisms were isolated.

Of the total of 103 outbreaks, 68 resulted from food, 5 from water, and 3 from milk; for 27, the source was not found. Three outbreaks were associated with milk products. One waterborne outbreak was caused by drinking water that had been contaminated with flood waters.

A large proportion of the gastroenteritis outbreaks resulted from improper handling of food in restaurants and cafeterias. Some occurred in picnic and labor groups following the consumption of food left unrefrigerated for hours in the open. Many outbreaks were in private homes and schools.

In 1953, a number of outbreaks were associated with Government surplus stock turkeys. Although turkeys were responsible for a large number of outbreaks in 1954, none implicated Government surplus stock.

A large outbreak involving approximately 50,000 cases is not shown in table 3. This outbreak occurred in the general population of a metropolitan area. Extensive laboratory examinations were made, but the etiological agent was not determined.

### Miscellaneous Outbreaks

Information was received regarding 10 outbreaks of diarrhea of the newborn which affected 140 infants and resulted in 27 deaths. In one instance, cases followed the return of a nurse who had been off duty 2 days with diarrhea. Two outbreaks occurred concurrently with numerous cases of diarrhea in the communities in which the hospitals were located. Overcrowding in the nursery for the newborn was considered as a contributing factor in one outbreak. Of the 27 deaths, 12 were reported to be in premature infants. In two outbreaks, *E. coli* were found in stool specimens.

Only two instances of laboratory infections were reported. In one, seven cases of endemic typhus fever probably resulted from inadequately sterilized equipment. A case of diphtheria developed in a laboratory technician who accidentally spilled a suspension of infectious material on her hands.

Information on 5 outbreaks of diphtheria was received from 4 States. Sixty-nine cases were reported, of which 25 occurred in and around a small town of 375 inhabitants. This was an unusually high incidence for an area of that size. In one State, the disease appeared among persons in older age groups, especially those housed in cheap transient hotels.

Streptococcal infections were reported by only two States. In one, there were 5 cases in a camp; in the other, 3 schools were involved and approximately 400 pupils developed the disease. In all instances, the disease was spread by personal contact.

An outbreak of arthropod-borne encephalitis was reported in the Rio Grande Valley of Texas during August and September 1954. It is estimated that about 600 cases occurred. The St. Louis type of virus was isolated from two fatal cases, and serologic tests also indicated this type of infection. In California, 96 laboratory confirmed cases of St. Louis encephalitis and 22 cases of western equine type of infection were reported in July through September. In 1952, 375 laboratory confirmed cases of western equine encephalitis and 45 cases of St. Louis type of infection were reported. In addition to these outbreaks, an unusually large number of meningoencephalitis cases were reported in Oregon.

Marsh gas poisoned 11 persons of a crew who were constructing a sewer line through marshy land. Poor ventilation in the trench permitted a sufficiently high concentration of gas to cause symptoms in some workers.

Epidemiological information was received on 34 outbreaks of infectious hepatitis. The infection in most of these outbreaks was considered to have been spread by person-to-person contact. No common source—such as food, milk, or water—was found in any of these outbreaks. Twenty-five of the total outbreaks occurred in schools and institutions, particularly institutions housing mentally ill patients.

Three outbreaks were among persons of low-income status. While the number of cases reported in epidemics was 1,315 in 1954, compared with 1,578 for 1953, the total numbers of cases reported weekly for 1953 and 1954 were 33,382 and 49,739, respectively. This indicates that many outbreaks probably were not investigated or reported.

The only outbreak of locally acquired infection reported was a group of four cases of malaria in one family. A high incidence of Cocksackie virus infections was reported in various parts of a State, and group B virus was isolated from many of the cases. Several hundred cases of an infection characterized by a purplish maculoannular rash was reported in one area, the etiology of which was not determined. Numerous reports on the epidemiological investigation of tularemia cases were received, all of which followed exposure to rabbits. Other reports included information on cases of ringworm, psittacosis, scrub typhus, mycotic infections, leprosy, Rocky Mountain spotted fever, brucellosis, anthrax, and leptospirosis.

Epidemiological information on 9 cases of human rabies occurring in 1954 were received, 3 from 1 State, and 1 each in 6 different States.

Only 2 instances of plague infection were reported in continental United States, and 2 in Hawaii. Each of these represent an isolation from rat fleas.

Information on 8 suspect cases of smallpox in 6 States was received. However, acceptable criteria for confirmation of diagnosis were lacking in each of them.

Although some outbreaks of poliomyelitis were reported, they are not included in this report.

There were no widespread outbreaks of influenza in the United States in the winter of 1953-54. Its sporadic occurrence has been reported by Davis (4).

## Summary

This report summarizes the outbreaks and epidemiological information on unusual occurrences of diseases in the United States in 1954. Since outbreaks from common sources—food and water—appear to be brought more com-



monly to the attention of public health officers and to be investigated, reports on these outbreaks constitute a large part of the material presented here.

The relative frequency of the various types of disease outbreaks, by States, and the frequency of foodborne and waterborne disease in different groups of persons are discussed.

There is reason to believe that the reports received represent only a fraction of the outbreaks that actually occurred. Reports appear to be relatively complete in some States and poor or nonexistent in others.

#### REFERENCES

- (1) Smith, G.: Plague on us. New York, The Commonwealth Fund, 1941.
- (2) Megonnell, W. H., and Garthe, E. C.: Dining car sanitation in the United States. Pub. Health Rep. 70:25-34, January 1955.
- (3) Gayler, G. E., MacCready, R. A., Reardon, J. P., and McKernan, B. F.: An outbreak of salmonellosis traced to watermelon. Pub. Health Rep. 70:311-313, March 1955.
- (4) Davis, D. J.: Occurrence of influenza, July 1953 to June 1954. Pub. Health Rep. 69:1150, December 1954.

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*Bicarbonates, sulfates, and chlorides of calcium and magnesium in water are appraised as a source of interference with the germicidal action of quaternary ammonium compounds at various temperatures.*

## Bactericidal Efficiency of Q.A.C. in Different Waters

By CECIL W. CHAMBERS, A.B., PAUL W. KABLER, M.D., Ph.D., ALTON R. BRYANT, B.S.,  
LESLIE A. CHAMBERS, Ph.D., and MORRIS B. ETtingER, M.S.

INTERFERENCE of natural tap water with the bactericidal action of quaternary ammonium compounds (Q.A.C.) was first reported by Hanne, referred to by Lawrence (1), and has since been confirmed by other investigators: Public Health Service (2), Ridenour and Armbruster (3), Shere (4), Butterfield, Wattie, and Chambers (5), Humphreys and Johns (6), and others. This study was initiated to further determine and evaluate some of the causes of inhibition of Q.A.C. bactericidal action.

### Experimental Methods

One ml. of *Escherichia coli* ATCC-11229 suspension was added to 99 ml. of water-germicide mixture to produce an initial bacterial density of approximately 100,000,000 organisms per ml. Test temperatures were thermostatically controlled at the various levels reported. At spe-

cific intervals, aliquots were transferred to Tween 80 Asolectin neutralizer, Weber and Black (7), from which duplicate portions were planted for agar plate colony counts. An experiment usually was made with 2 or 3 replicate test flasks for each germicide.

The method used was similar to the Weber-Black procedure (7) but differed from it as follows: (a) larger volumes were used to provide material needed for chemical control tests; (b) more than one test temperature was used; (c) bacterial suspension was prepared in phosphate buffered water instead of in test water; (d) suspension was filtered through sterile paper, eliminating most of the "freak jumps"; (e) suspension was stored in ice throughout a given experiment (this did not affect the test temperature as the ratio of suspension to test water was 1 ml. to 99 ml.); (f) culture was added to test mixture instead of test mixture to culture; (g) duplicate plates, using phosphate buffered dilution water, were planted in the range expected to yield 30 to 300 colonies; (h) initial and final numbers determinations were based on triplicate plates.

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### Controls and Compounds

Sterility control was maintained on all water, neutralizer, media, dilution blanks, and equipment used. It was inadvisable, due to the

breakdown of bicarbonates, to sterilize raw and tap waters. Controls indicated the presence of extraneous bacteria in some of these waters. Such contaminants, when present, were insufficient in number to affect the initial numbers determination at a dilution of  $10^{-6}$ . These organisms did not result in germicide consumption, and they were killed during the waiting period allowed for the test mixture to come to constant temperature. However, when such contaminants were present on control plates, representative colonies were transferred to lactose broth to prove the absence of coliform organisms. Likewise, representative colonies surviving the longest exposure in germicide tests were transferred to lactose to exclude the possibility of counting extraneous noncoliform contaminants as *E. coli*.

The quaternary ammonium compounds used were: compound A—alkyl dimethyl benzyl ammonium chloride; compound B—para diisobutyl phenoxy ethoxy ethyl dimethyl benzyl ammonium chloride, and compound C—alkyl tolyl methyl trimethyl ammonium chloride.

#### *Water Selection, Preparation, Measurement*

Norwood, Ohio, well water was used in a considerable portion of this work because: (a) it was readily available; (b) previous studies (2, 5) had shown that this water interfered with Q.A.C.; (c) waters with an equal or higher mineral content are common on many dairy farms; (d) numerous municipalities, especially in the west and southwest, use waters with equally high or higher mineral content. The State health departments of Arkansas, Kansas, and Texas provided laboratory facilities, engineering services, and sample collectors, which enabled personnel associated with this project to conduct laboratory investigations in these areas.

Forty-five different types of well, tap, synthetic (distilled water with minerals added), softened, and sequestered waters were investigated. Tap and well waters were used fresh and unaltered, except when chlorine was present a slight excess of sodium sulfite was used for dechlorination. These waters were also investigated after being treated as follows: (a) boiled 2 hours, evaporation loss being restored with distilled water; (b) boiled, cooled,

and recarbonated with  $\text{CO}_2$ , then decarbonated by shaking to adjust pH to the same level as that of the raw water before boiling; (c) stored at room temperature for 3 to 10 days; (d) lime softened; (e) partially softened by zeolite; (f) sequestered with either sodium hexametaphosphate (S.H.M.P.), tetrasodium pyrophosphate (T.S.P.P.), or the tetrasodium salt of ethylenediamine tetra acetic acid (E.D.T.A.).

In all experiments, any precipitate in the water was suspended by agitation while aliquots were being transferred to test flasks. Lime-softened water, in which removal of the sediment is an integral part of the process, was an exception to the preceding statement.

#### **Results**

Space limitations prevent the presentation of all data available. Results reported are considered representative of the more significant trends. With the exception of two tables, data obtained with long exposure intervals have been deleted. Findings are reported as percentages of bacteria surviving for a given exposure, based on the initial numbers determination as 100 percent.

A succession of individual experiments, constituting a series, were run with fresh, synthetic, or treated water. In a series using fresh and treated water, aliquots of treated water as well as those used unaltered were drawn from a common sample of fresh water. Most results reported are averages obtained in two or more series of individual experiments. Each series started with a new sample of water of a given type or, in the case of synthetic water, a freshly prepared batch. There was relatively little experimentation with trace elements and exclusion tests.

#### *Calcium and Magnesium*

According to Foulk (8), calcium and magnesium usually occur as bicarbonates in waters found in strata of the type bearing Norwood water. Therefore, the effect of these bicarbonates was investigated in natural waters and as the pure compounds produced in distilled water.

In tests with compound A in raw Norwood water, with a total hardness of 410 p.p.m. and

a combined calcium and magnesium bicarbonate content of about 350-375 p.p.m., marked interference with bactericidal action occurred (table 1). In this and all future references, bicarbonate alkalinities (regardless of attached ion), calcium salts, magnesium salts, and hardness are given as p.p.m.  $\text{CaCO}_3$  according to reporting conventions of Standard Methods for the Examination of Water and Sewage (9). Additional results with raw Norwood water are presented in tables 4 and 5.

When an aliquot of Norwood water was boiled, precipitating the bulk of the bicarbonates as normal carbonates, the bicarbonate and hardness content dropped to 70 p.p.m. and 90 p.p.m., respectively, and interference was re-

duced from 8- to 25-fold at exposure intervals of 1 and 2 minutes (table 1). Recarbonation of an aliquot of this same water restored the interference. A comparison of results presented in tables 1 and 2 shows that pure calcium and magnesium bicarbonate in distilled water, in amounts equivalent to the total bicarbonate content of Norwood water, interfere to a degree comparable to raw Norwood water. In all instances rapid kills were obtained in distilled water with no hardness added.

The effect of several calcium and magnesium salts in distilled water, at concentrations equivalent to the total calcium and magnesium content of Norwood water, was investigated. These results indicated that, within the limits of the

Table 1. Effect of different waters on the bactericidal efficiency of Q.A.C.

Water source and Q.A.C.	pH	Average percentage of <i>Escherichia coli</i> surviving at 22° C. after (minutes)						
		Fresh tap water						
		¼	1	2	5	10	20	30
<i>Compound A</i> , <sup>1</sup> 50 p.p.m.								
Topeka, Kans.....	9.8	104	16	4.8	0.015	<0.0001	-----	-----
Dermott, Ark.....	9.5	0.0003	0	0	-----	-----	-----	-----
Port Isabel, Tex.....	7.5	-----	-----	-----	110	104	56	6.4
Norwood, Ohio.....	7.6	96	64	38	12	0.24	0.0036	<0.0001
San Benito, Tex.....	8.3	-----	-----	71	49	17	0.21	0.0007
<i>Compound B</i> , <sup>2</sup> 200 p.p.m.								
Topeka, Kans.....	9.8	6.1	0.076	0.0062	0.0003	-----	-----	-----
Dermott, Ark.....	9.5	<0.0001	0	0	-----	-----	-----	-----
Port Isabel, Tex.....	7.5	-----	99	107	88	86	78	67
Norwood, Ohio.....	7.6	92	20	8.6	2.1	0.78	0.017	0.0026
San Benito, Tex.....	8.3	54	4.0	0.22	0.015	0.0031	0.0005	0.0001
Boiled tap water								
<i>Compound A</i> , <sup>1</sup> 50 p.p.m.								
Topeka, Kans.....	8.3	89	47	26	2.1	0.030	-----	-----
Dermott, Ark.....	9.4	0.016	0	0	-----	-----	-----	-----
Port Isabel, Tex.....	7.9	-----	-----	-----	-----	-----	53	12
Norwood, Ohio.....	8.7	91	8.3	1.4	0.0003	0	0	-----
San Benito, Tex.....	8.3	-----	-----	-----	20	3.2	0.0062	-----
<i>Compound B</i> , <sup>2</sup> 200 p.p.m.								
Topeka, Kans.....	8.3	11	0.24	0.086	0.0009	-----	-----	-----
Dermott, Ark.....	9.4	0	0	0	-----	-----	-----	-----
Port Isabel, Tex.....	7.9	-----	-----	-----	-----	-----	-----	-----
Norwood, Ohio.....	8.7	3.2	0.0077	0.0005	<0.0001	-----	33	27
San Benito, Tex.....	8.3	27	3.8	0.57	0.071	0.0064	-----	-----

<sup>1</sup> Alkyl dimethyl benzyl ammonium chloride.

<sup>2</sup> Para diisobutyl phenoxy ethoxy ethyl dimethyl benzyl ammonium chloride.

Table 2. The bactericidal efficiency of Q.A.C. in distilled water containing salts of calcium and magnesium<sup>1</sup>

Q.A.C. and salt added	Average pH		Average percentage of <i>Escherichia coli</i> surviving at 22° C. after (minutes)						
	Initial	Final	¼	1	2	5	10	20	30
Compound A, <sup>2</sup> 50 p.p.m.									
MgSO <sub>4</sub> -----	8.1	7.3	102	86	85	22	0.076	0.0014	-----
MgCl <sub>2</sub> -----	8.9	8.2	-----	-----	90	24	0.10	<0.0001	-----
Mg(HCO <sub>3</sub> ) <sub>2</sub> -----	8.3	8.3	95	29	11	0.85	0.0003	0	-----
CaSO <sub>4</sub> -----	8.2	7.5	92	90	81	49	2.3	0.011	-----
CaCl <sub>2</sub> -----	8.3	8.0	-----	103	92	68	6.6	0.022	-----
Ca(HCO <sub>3</sub> ) <sub>2</sub> -----	7.4	7.4	92	80	77	48	8.9	0.0015	-----
Compound B, <sup>3</sup> 200 p.p.m.									
MgSO <sub>4</sub> -----	8.0	7.1	95	70	58	25	7.4	0.86	0.16
MgCl <sub>2</sub> -----	8.9	7.7	-----	84	64	33	9.1	1.8	0.42
Mg(HCO <sub>3</sub> ) <sub>2</sub> -----	7.8	7.8	88	27	10	1.5	0.28	0.0061	0.0005
CaSO <sub>4</sub> -----	8.2	7.2	87	51	22	6.6	2.2	0.40	0.084
CaCl <sub>2</sub> -----	8.3	7.4	-----	59	31	10	3.2	0.58	0.19
Ca(HCO <sub>3</sub> ) <sub>2</sub> -----	7.4	7.4	78	25	12	3.7	1.2	0.16	0.013

<sup>1</sup> All solutions are equivalent to 375 p.p.m. CaCO<sub>3</sub>.  
<sup>2</sup> Alkyl dimethyl benzyl ammonium chloride.  
<sup>3</sup> Para diisobutyl phenoxy ethoxy ethyl dimethyl benzyl ammonium chloride.

methods used, there was little difference in the effect of the various salts (table 2). However, the interference of all these salts was significant at the concentrations tested.

Iron

In highly carbonated waters, iron occurs as the bicarbonate according to Foulk (8). Mueller and Seely (10) demonstrated interference with 10 p.p.m. of iron as Fe<sup>++</sup> ion at pH 4.0 or lower, but they indicated that above pH 4.0 hydrolysis occurs and interference disappears. However, in many farm dairy uses water is drawn and mixed with germicide before hydro-

lysis can take place. Therefore, information regarding the effect of iron in the native state should be of value.

Ferrous bicarbonate was produced and maintained in a closed system under nitrogen washed through 5 successive alkaline pyrogallol traps followed by 1 water trap. Experiments were run with 10 p.p.m. of iron as bicarbonate and, also, with a like amount as bicarbonate that was first oxidized by aeration until the test for Fe<sup>++</sup> was negative and a Fe<sup>+++</sup> test showed 10 p.p.m. Bactericidal tests in the presence of ferrous bicarbonate were made with oxygen free nitrogen streaming through the flasks,

Table 3. The effect of iron on the bactericidal efficiency of Q.A.C. at pH 6.1-7.0

Q.A.C.	10 p.p.m. iron as	Valence	Average percentage of <i>Escherichia coli</i> surviving at 22° C. after (minutes)				
			¼	1	2	5	10
Compound A, <sup>1</sup> 50 p.p.m.-----	Fe(HCO <sub>3</sub> ) <sub>2</sub> -----	Fe <sup>++</sup> -----	26	0.90	0.054	0.010	0.0006
	Fe(HCO <sub>3</sub> ) <sub>2</sub> oxidized-----	Fe <sup>+++</sup> -----	0.0072	0.0095	0.010	0	0
Compound B, <sup>2</sup> 200 p.p.m.-----	Fe(HCO <sub>3</sub> ) <sub>2</sub> -----	Fe <sup>++</sup> -----	0.26	0.0019	0.0007	<0.0001	-----
	Fe(HCO <sub>3</sub> ) <sub>2</sub> oxidized-----	Fe <sup>+++</sup> -----	0.10	0	0	0	-----

<sup>1</sup> Alkyl dimethyl benzyl ammonium chloride.  
<sup>2</sup> Para diisobutyl phenoxy ethoxy ethyl dimethyl benzyl ammonium chloride.

above the test mixture, throughout the experiment. With ferrous bicarbonate, initial and final tests from each individual flask showed 10 p.p.m.  $\text{Fe}^{++}$  and 0 p.p.m.  $\text{Fe}^{+++}$ . The bicarbonate form was verified by titration. In experiments with ferrous bicarbonate, solutions were clear and colorless at the conclusion of tests. The results show that at pH 6.1 to 7.0 the interference of  $\text{Fe}^{++}$  is greater than that of  $\text{Fe}^{+++}$  (table 3).

### *Effects of Different Waters*

Wyoming, Ohio, water originally has a total hardness of 520 p.p.m. and a bicarbonate content of 320 p.p.m. It is softened by lime-soda to a total hardness of 100 p.p.m. and a bicarbonate content of 60 p.p.m. Germicidal interference of this softened water was low, but restoration of the hardness by the addition of calcium bicarbonate resulted in marked interference. Control tests eliminated pH variations as the responsible factor.

Topeka, Kans., tap water was similar to that from Wyoming, Ohio, and likewise caused relatively little interference with compound B (table 1), but it did result in more interference with compound A than was true of Wyoming, Ohio, water. The boiling of Topeka water increased the interference slightly. In this case no mineral was precipitated, but the drop from pH 9.8 to 8.3 was probably a contributing factor.

Table 1 also shows the effect of Dermott, Ark., water (hardness 8 p.p.m. and total mineral content 252 p.p.m.) in which the major part of the mineral content is sodium and potassium bicarbonate (200 p.p.m.) and chloride (27 p.p.m.). Interference was very low in this water. To establish that this lack of interference was not due to the high pH (9.5), tests were run with 375 p.p.m. of sodium bicarbonate in distilled water at pH 7.5 to 7.9 in parallel with tests using raw Norwood water at the same pH. The results clearly indicated that sodium bicarbonate does not interfere under these conditions. These results also showed a marked difference between the interference in Norwood water and that of a synthetic water containing an equivalent concentration of bicarbonate as sodium bicarbonate.

Tests with Cincinnati, Ohio, tap water showed some interference at bicarbonate and total hardness levels of 33 p.p.m. and 94 p.p.m., respectively. Boiling had relatively little effect on this water in which a large percentage of the total hardness is permanent in nature. This is in marked contrast to Norwood water in which 90 percent of the total hardness is present as bicarbonate.

San Benito, Tex., tap water had a total mineral content of 1,150 p.p.m., of which 366 p.p.m. was hardness and a considerable portion of the latter was of the permanent type. Significant interference with germicidal action occurred in this water, and the interference was reduced somewhat by boiling.

Port Isabel, Tex., tap water had a total mineral content of 3,200 p.p.m. and 1,100 p.p.m. total hardness, mostly of the permanent type. This water represents the maximum interference ever encountered in studies with these compounds at the Robert A. Taft Sanitary Engineering Center (table 1). Boiling resulted in very little reduction of interference in this water, as might be expected, since permanent hardness is not affected by boiling.

### *Exclusion Tests*

Norwood water contained a small amount of barium and strontium. No significant interference was noted in tests made with a mixture of barium and strontium bicarbonate in a concentration equivalent to the barium and strontium content of Norwood water.

Norwood water contained about 20 p.p.m. of silicon. Therefore, it was considered desirable to study the effect of this element in distilled water. Foulk (8) states that silica in underground waters is generally considered to be in the form of uncombined silicic acid. Accordingly, silicic acid was added to distilled water to produce a concentration of 20 p.p.m. as silica. The solution was initially adjusted to pH 10.0, using sodium hydroxide, in order to facilitate solution of the silicic acid. Storage overnight resulted in solution of the silicic acid while the pH dropped to 7.3. Because sodium hydroxide was used in the preparation of this water, it is probable that the silica was present as sodium silicate at the time the water was used in bacteriological tests. The ef-

the hardness to approximately 75 p.p.m. Additional data were obtained using varying amounts of E.D.T.A. without regard for alterations in hardness or pH. The addition of 0.3 percent E.D.T.A. further enhanced the activity of the Q.A.C. However, control tests indicated that 0.3 percent E.D.T.A. exerted a definite germicidal effect within 10 minutes but not within 2 minutes. Similar controls, with 0.2 percent E.D.T.A., established that there was no bacterial toxicity during a 10-minute exposure.

Data obtained indicate that at a concentration of 200 p.p.m. all Q.A.C. tested are reasonably effective at 37° C. in Norwood water containing 0.2 percent E.D.T.A. In similar tests at 22° C. the efficiency of compounds B and C was fair to marginal while that of A remained good. The latter was the only compound which showed good response at 10° C. in Norwood water treated with 0.2 percent E.D.T.A.

## Discussion

The present study was concerned solely with the effect of the mineral content of waters on the bactericidal action of Q.A.C. Therefore, important public health considerations such as viruses, fungi, and the effect of factors like proteinaceous material, residual soap, and other foreign materials were not considered.

In the first part of this investigation, Q.A.C. concentrations were set at levels considered best for determining variations due to different types of waters used. Accordingly, results reported were not, in all instances, obtained under conditions best suited to an evaluation of the various germicides (13). The concluding work in this study was directly concerned with concentrations recommended for use. However, the scope of this investigation made it necessary to limit tests to three chemical types of Q.A.C.

Interference with germicidal action was generally high in waters having high concentrations of soluble calcium and magnesium salts. Any treatment which tended to precipitate, remove, or inactivate calcium or magnesium reduced the interference. Further evidence of the role of these salts was indicated by increased interference when boiled water was recarbo-

ated or calcium carbonate was added to plant softened water, followed by recarbonation.

Waters in which practically the entire mineral content was bicarbonates of sodium and potassium did not interfere. Boiling, which converted much of the bicarbonate to normal carbonate, did not significantly alter the interference pattern in such a natural water.

High mineral content alone did not necessarily result in high germicidal interference. Bactericidal results with Norwood and San Benito water were similar, although San Benito water has a much higher total solids content. The concentration of calcium and magnesium salts in these two waters is similar in quantity but different in type, occurring mostly as the bicarbonate in Norwood water and as the sulfate in San Benito water. This tends to confirm, in natural waters, the results obtained in synthetic waters, namely, that equivalent concentrations of various soluble calcium and magnesium compounds interfere to approximately the same degree. The nonhardness salts in San Benito water were those of sodium and potassium, and did not appear to have contributed to the interference. This finding coincides with the observations noted in tests with distilled water containing sodium bicarbonate, as well as in Dermott, Ark., water. Still further evidence in this regard was indicated by the significant reduction in interference in Norwood water partially softened by zeolite where sodium was substituted for calcium and magnesium.

The effect of temperature is marked, and the trend is similar to that reported by McCulloch and associates (14). At 10° C. all of the compounds at a concentration of 200 p.p.m. showed marked interference in Norwood water.

The analyses of Topeka and Cincinnati water were nearly identical insofar as hardness and alkalinity were concerned. Freshly drawn Cincinnati water interfered with germicidal action somewhat more than Topeka water. The difference in pH could be responsible for the different reactions in these otherwise similar waters. Ridenour and Armbruster (3), Mueller and Seeley (10), and others have shown that the activity of Q.A.C. is enhanced by high pH values. When Cincinnati and Topeka waters were boiled, the pH of Cincinnati water in-

ereased while that of Topeka water decreased. This shift was accompanied by a slight decrease in interference in Cincinnati water while that of Topeka water increased somewhat.

Practical differences in the various methods of treating Norwood water were apparent. There was little difference in either the appearance or interference of the lime or partially softened zeolite-treated water at 75 p.p.m. hardness. Both treatments produced sparkling clear water. However, as a final rinse for utensils, lime or lime-soda softened water, due to the marked reduction in total dissolved solids content, should leave air dried glassware in a much more presentable condition than would be the case with zeolite-softened water.

Water treated with E.D.T.A. was clear while that treated with T.S.P.P. was very turbid. Since both of these additives, even though somewhat more effective than lime or partial zeolite softening in reducing interference, increase the total salt content of a water already high in dissolved solids, the effect on air dried glassware and equipment probably would leave much to be desired.

### Summary

Many waters interfere with the bactericidal action of quaternary ammonium compounds. In this study hard waters have been shown to interfere seriously. Bicarbonates, sulfates, and chlorides of calcium and magnesium appear to be the primary cause of interference. Ferrous bicarbonate interfered to a moderate degree, but this interference was minimized when the iron was oxidized.

Natural waters in which the bulk of the mineral content was sodium and potassium bicarbonate did not seriously interfere with the germicidal action of Q.A.C. When such waters were boiled, most of the bicarbonates were converted to normal carbonates with no apparent change in interference.

Lime and partial zeolite softening removed a considerable portion of the interference from a hard water used in tests. Tetrasodium pyrophosphate and the tetrasodium salt of ethylenediamine tetra acetic acid reduced the interference of this water sufficiently to offer promise for use in practical applications.

### REFERENCES

- (1) Lawrence, C. A.: Surface-active quaternary ammonium compounds. New York, Academic Press, Inc., 1950, p. 34.
- (2) U. S. Public Health Service, Sanitary Engineering Division: Quaternary ammonium compounds for bactericidal treatment of utensils. Statement prepared at the request of Conference of State Sanitary Engineers meeting in Washington, D. C., May 7-8, 1947. Washington, D. C., The Service, 1947. Mimeographed.
- (3) Ridenour, G. M., and Armbruster, E. H.: Some factors affecting the properties of quaternary ammonium compounds as sanitizers. *Am. J. Pub. Health* 38: 504-511, April 1948.
- (4) Shere, L.: Some comparisons of the disinfecting properties of hypochlorites and quaternary ammonium compounds. *Milk Plant Monthly Report*, March 1948.
- (5) Buttersfield, C. T., Wattie, E., and Chambers, C. W.: Bactericidal efficiency of quaternary ammonium compounds. *Pub. Health Rep.* 65: 1039-1056, Aug. 18, 1950.
- (6) Humphreys, T. W., and Johns, C. K.: Bacteriological evaluation of quaternary ammonium compounds alone and in detergent formulations. *J. Milk and Food Tech.* 16: 180-188, July-August 1953.
- (7) Weber, G. A., and Black, L. A.: Laboratory procedure for evaluating practical performance of quaternary ammonium and other germicides proposed for sanitizing food utensils. *Am. J. Pub. Health* 38: 1405-1417, October 1948.
- (8) Foulk, C. W.: Geological survey of Ohio. Fourth series. *Bull.* 29, item 2, p. 9; item 525, p. 159; and item 69, p. 29, 1925.
- (9) American Public Health Association: Standard methods for the examination of water and sewage. Ed. 9. New York, The Association, 1946.
- (10) Mueller, W. S., and Seeley, D. B.: Effect of metallic ions on germicidal activity of quaternary ammonium germicides. *Soap and Sanitary Chemicals* 27: 131-143, November 1951.
- (11) Armbruster, E. H., and Ridenour, G. H.: Effect of various water ions on the bactericidal properties of quaternaries. *Soap and Sanitary Chemicals* 25: 103, July 1949.
- (12) Elliker, P. R.: Quaternary ammonium compounds. *Am. Milk Rev.* 12: 39, 42, October 1950.
- (13) Hartman, F. W., and Yee, L.: A current method for evaluating quaternary ammonium compounds. Paper presented at the 79th annual meeting of the American Public Health Association, San Francisco, Calif., Oct. 29-Nov. 2, 1951.
- (14) McCulloch, E. C., Hauge, S., and Migaki, H.: Quaternary ammonium compounds in sanitation. *Am. J. Pub. Health* 38: 493-503, April 1948.



# An Experience in Home Injury Prevention

By HARRY WAIN, M.D., M.P.H., HAROLD E. SAMUELSON, M.P.H., and F. M. HEMPHILL, Ph.D.

AN EXPERIENCE in accident prevention in Richland County, Ohio, known as the home safety notebook project, sought to motivate families to keep a record of injuries in the home. It appears to have demonstrated that such families soon establish safety patterns that perceptibly reduce the rate of injuries.

The project was undertaken by the health committee of the Mansfield Parent-Teacher Association Council in cooperation with the home safety program of the Mansfield-Richland County Health Department. Two major purposes were (a) to test acceptability to home-makers of the methods used and (b) to measure change in frequency of injuries during a 16-week period. In addition, data on type of injury, location and activity of persons at the time of injury, parts of the body injured, and other injury characteristics were to be obtained.

The Mansfield-Richland County Health Department is 1 of 3 local health departments in the Nation carrying on a 5-year home safety program through a grant from the W. K. Kellogg Foundation. The home safety notebook project is one of many projects developed

during the course of this program, which was begun in the fall of 1951.

## The Basic Plan

The recording by family members of all home injuries, regardless of severity, constituted the basic plan of action. The record was kept in a calendar-notebook, a booklet designed to facilitate the recording of selected information about each injury. The chairman and co-chairman of the PTA council health committee directed the project, and the chairman of each individual PTA health committee supervised the work of the participants.

The methods used in the project were modifications of those used in the home injury prevention experience conducted by the Washtenaw County Health Department of Michigan (1). In the Washtenaw County experience, public health nurses provided supervision and 95 families participated.

A total of 119 families agreed to keep safety records in the Richland County project. Ten or eleven families were selected from each of the PTA groups or mothers clubs in 10 elementary schools, and 14 families were from the health department staff. Participants were selected on the basis of agreement to cooperate and did not represent a random selection of families in the PTA or in the city.

Before the recording began, all PTA workers were given 1 hour of instruction in objectives and procedures by the health department home safety director. Following this orientation, each chairman visited the families in his group

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and explained to a responsible member, usually the housewife, the objectives of the project, terms used, and procedures for keeping the record. Drills in filling in the notebook were held. The time for starting the records varied within different PTA groups, but all were begun within a 4-week period, in October and November 1953.

On cards furnished by the health department, the health committee chairman recorded the names, ages, and injury data for the families in their group. Approximately every 2 weeks, they contacted the families, by visits to the home, by telephone, or at PTA meetings, to secure or to give information about the project.

During the 16-week period, the health department's home safety director visited each family at least twice. These visits were intended to sustain interest and to secure con-

tinued participation, as well as to answer questions on procedures. The health department maintained close communication with the PTA workers and at various stages of the project sent mimeographed newsletters to the families.

The fact that no families withdrew from the experience indicates that there was substantial interest on the part of those participating. However, the records of 5 families were unsuitable for use in the tabulation of data. One family moved from the area; 1 family's record was destroyed during an intercity household move; 1 record was not usable because of a misunderstanding regarding the completion date; and 2 records were lost or misplaced.

The possibility exists that the family member who recorded the injuries was less conscientious in performing the task toward the end of the study period. However, for several reasons,

Table 1. Injury frequency data, according to sex and age groups

Age and sex groups	Number of persons in study	Number of persons injured, by number of injuries					Total number of persons injured	Percent of persons injured	Number of injuries	Number of injuries per 100 persons	Average number of injuries per injured person
		1	2	3	4	5					
<i>Males</i>											
0-4.....	21	5	3	1	1	2	12	57	28	133	2.3
5-9.....	54	20	5	2	0	0	27	50	36	67	1.3
10-14.....	39	7	4	2	0	0	13	33	21	54	1.6
15-19.....	13	4	0	0	0	0	4	31	4	31	1.0
20-24.....	2	0	0	0	0	0	0	0	0	0	0
25-29.....	9	5	0	0	0	0	5	56	5	56	1.0
30-34.....	13	1	0	0	0	0	1	8	1	8	1.0
35-39.....	34	10	1	0	0	0	11	32	12	35	1.1
40-44.....	26	5	0	0	0	0	5	19	5	19	1.0
45-49.....	16	3	0	0	0	0	3	19	3	19	1.0
50-54.....	11	1	0	0	0	0	1	9	1	9	1.0
55 and over.....	6	0	0	0	0	0	0	0	0	0	0
Total.....	244	61	13	5	1	2	82	34	116	48	1.4
<i>Females</i>											
0-4.....	14	4	1	3	0	2	10	71	25	179	2.5
5-9.....	55	16	6	5	0	0	27	49	43	78	1.6
10-14.....	44	10	1	1	0	0	12	30	15	34	1.2
15-19.....	12	3	2	0	0	0	5	42	7	58	1.4
20-24.....	1	0	0	0	0	0	0	0	0	0	0
25-29.....	17	7	0	5	0	0	12	71	22	129	1.8
30-34.....	19	5	3	2	0	1	11	58	22	116	2.0
35-39.....	31	9	9	0	0	0	19	61	35	113	1.8
40-44.....	29	8	1	2	4	1	16	55	37	128	2.3
45-49.....	8	4	2	1	0	0	7	88	11	138	1.6
50-54.....	5	2	2	0	0	0	4	80	6	120	1.5
55 and over.....	15	5	0	1	0	0	6	40	8	53	1.3
Total.....	250	73	27	20	4	4	129	52	231	92	1.9

<sup>1</sup> One person had 8 injuries.

it is believed that the recording of injuries was faithful and continuous during the entire 16 weeks. As noted above, careful observation and close supervision were accorded the project throughout the period. Moreover, many families recorded injuries occurring outside the home as well as those occurring inside the home, and some families continued to record injuries during the several days between the end of the project and the collection of the records.

### Conditions and Definitions

Certain conditions were inherent in the plan of this project, and selected definitions had to be imposed on the data in order to tabulate and summarize them.

Selection of the families to participate in the experience was without any known probability basis. Consequently, those selected do not constitute a statistical sample of known design, and there is no basis on which to assume that they were representative of the population of Richland County. In fact, certain characteristics of the participating families—age distribution, for example—would be expected to be at great variance from those of the county's population.

As shown in table 1, there were 244 males and 250 females in the 114 families whose records were analyzed, a male/female ratio of 0.976. This ratio is similar to that found in large population groups. The age distribution of the 494 persons, however, is notably unlike that of the general population in that there are far too few persons aged 0-4 years and 15-34 years. The person-per-family ratio was 4.3, which is well above the national average of 3.5.

Previous research studies of some 2,500 families in Washtenaw County, Mich., had indicated that rates of accidental injuries incurred within homes were relatively homogeneous by rural-urban and family income groups (1). These findings led to the expectation that rates for the Richland County families would simulate those for the Washtenaw County families if the following assumptions were made: (a) family constituency, living conditions, and other socioeconomic factors for the groups were similar; (b) the season of year in which the experiences were accumulated did not influence

the rate; (c) the groups were large enough to reflect the injury rate with relative accuracy; (d) conditions of instruction, motivation, and recording of events were essentially equal; (e) other pertinent factors were similar. Insofar as rates from this experience are found to parallel those from the Washtenaw County experiences, bases may be formed for acceptance or rejection of these assumptions.

Instructions on recording injuries included the following:

1. Record all injuries in the notebook provided by the health department.
2. Record all injuries occurring in your home or in other homes to members of your household, including relatives and others living with you.
3. Record the injury as soon as practicable after it occurs.
4. Give the best answer you can for each item of information requested and be as specific as necessary to be clear.
5. Refer all questions concerning the project to the PTA chairman of your group.

For this project, the term "home" was defined as the dwelling and yard area used for usual home activities. Not included within this definition are public and community playgrounds, parks, and buildings and areas used primarily for agricultural and vocational purposes. Several families recorded all injuries regardless of the place of occurrence, but because they gave the location clearly selection of the home injuries was an easy task.

Each injury was classified by the analysts as major or minor. A major injury was an injury having one or more of the following characteristics: (a) preventing usual activity for 1 hour or more; (b) costing \$1 or more for treatment; (c) receiving professional treatment. Any other injury was classified as minor.

### Injury Frequency Patterns

Analysis of the recorded injuries by age and sex shows that males under 20 years of age exhibited approximately the same injury frequency pattern as did females in this age group (table 1). However, the male/female ratio of injuries for persons 20 years of age or over was

approximately 1:5. For all ages, females suffered about twice as many injuries as did the males.

The frequency of recorded injuries among both sexes was substantially reduced during the time of this project, as shown in table 2. The reductions after the first 2 weeks tended toward plateaus rather than regular decrements by time intervals. Graphically, these reductions resemble an inverted learning curve, suggesting that persons in this experience gradually adopted or learned safer ways of home life.

**Table 2. Injury frequency data, according to week of participation**

Week	Number of injuries, major and minor			Injury rate per person-year	Number of major injuries		
	Males	Females	Total		Males	Females	Total
1st.....	17	42	59	6.2	0	3	3
2d.....	10	24	34	3.6	0	1	1
3d.....	8	15	23	2.4	0	2	2
4th.....	9	15	24	2.5	1	1	2
5th.....	8	18	26	2.7	0	0	0
6th.....	5	18	23	2.4	0	2	2
7th.....	10	15	25	2.6	0	1	1
8th.....	9	12	21	2.2	1	0	1
9th.....	5	12	17	1.8	0	2	2
10th.....	8	10	18	1.9	1	0	1
11th.....	5	10	15	1.6	0	1	1
12th.....	3	11	14	1.5	0	2	2
13th.....	4	6	10	1.1	1	0	1
14th.....	2	11	13	1.4	0	1	1
15th.....	5	8	13	1.4	0	1	1
16th.....	8	4	12	1.3	2	0	2
Total....	116	231	347	2.3	6	17	23

During the first week of the project, injuries were recorded at the rate of 6.2 per person-year. This rate is comparable to the estimated rate of 6.0 in the Washtenaw County research studies and to the rate of 5.5 reported for the week before the recording of injuries began in the county's 95-family experience. Furthermore, the reduction in rate of reported injuries among the Richland County families from 6.2 during the first week to 1.3 during the sixteenth week parallels the change from 6.1 in the first month to 1.2 in the fourth month among Washtenaw County's 95 families.

**Table 3. Number of injuries in males and females, according to location and activity when injury occurred**

Location or activity	Males	Females	Total
<b>Location:</b>			
Inside dwelling unit (exclusive of basement).....	60	177	237
Basement.....	21	21	42
Outside dwelling unit.....	26	21	47
Other places.....	9	12	21
Total.....	116	231	347
<b>Sublocation:</b>			
Bedroom, nursery.....	9	14	23
Living room.....	19	24	43
Kitchen.....	19	114	133
Dining room.....		10	10
Recreation room.....	5	3	8
Steps.....	5	9	14
Yard.....	14	13	27
Other places.....	25	27	52
Not ascertained.....	20	17	37
Total.....	116	231	347
<b>Activity:</b>			
Playing inside.....	39	36	75
Playing outside.....	13	8	21
Preparing meals.....	3	62	65
Household tasks.....	15	59	74
Walking.....	7	12	19
Walking on stairs.....	3	7	10
Running on stairs.....	3	4	7
Mechanical "do-it-yourself" activities.....	21	9	30
Others.....	11	32	43
Not ascertained.....	1	2	3
Total.....	116	231	347

These similarities in rates are very impressive. The experience in Richland County indicates that interested leaders of club groups with a relatively short period of training and with little expert supervision can make noteworthy contributions in the field of home accident prevention. It also indicates that the home-recording technique might be used profitably on a broad scale within a health jurisdiction by enlisting the cooperation of community organizations.

If injuries had continued at the rate of 59 per week, as during the first week, a total of 944 injuries would have accumulated. The 347 recorded are approximately 600 fewer than might have been expected. Of the 347 recorded injuries, 23 were classified as major injuries. If these had continued at the rate of 3 per week,

**Injury occurrences during specified hours of the day, by sex and age groups.**

[illegible]

as during the first week, 48 would have been recorded, or at the rate of 8 recorded for the first 4 weeks, 32 would have been reported.

The infrequency of major injuries among the families in this experience argues against drawing any conclusions from the data on these injuries. There appears, however, to have been a trend for reduction in major injuries during the same time that minor injuries were being reduced, at least among the females. Since descriptions of accidental injury occurrences rarely allow accurate prediction of the severity of the injury, programs of prevention may well be aimed at the often recurring events which terminate in minor injuries with the expectation that the number of severe injuries will be reduced concurrently.

### Injury Characteristics

Table 3 shows the location and type of activity when injuries were incurred. Predominance of injury to females was accounted for almost exclusively by "preparing meals" and "household tasks" and by location in the kitchen and dining room and on steps. At another season of the year, the yard might be expected to present a higher relative frequency of location, as was the case in the Washtenaw County research studies, and the entire pattern for males might be changed.

Males suffered injury most frequently during the hours of 11:00 a. m. and 1:00, 4:00, and 5:00 p. m. The frequency among females was greatest from 10:00 to 12:00 a. m. and from 4:00 to 8:00 p. m. (see chart). The variations in injury occurrences by hour of the day and by

age and sex groups suggest concentration of preventive effort at specific hours for the different groups. Children under 10 years appear to be injured during the afternoon and evening far more often than during the morning, and the times of highest frequency for adult females appear to be associated with the usual hours of meal preparation or other routine household tasks.

Cuts were the predominant type of injury, and bruises were next in importance (table 4). Burns from hot surfaces occurred approximately six times as frequently among females as among males. Cuts occurred most frequently among adult females; among males, children suffered cuts more frequently than adults. Children of both sexes suffered many more bruises than did their parents. These data provide suggestive bases for specific approaches to prevention, as well as indications for advice regarding first-aid practices.

The upper extremities, especially the fingers and the hand, suffered injury most often (table 5). Tabulations not presented in this paper showed that the injuries to these parts were largely cuts, with bruises and burns next in order. The majority of the difference between the number of injuries to females and the number to males was accounted for by injuries to the fingers and hands.

**Table 5. Number of injuries in males and females, according to part of the body injured**

Part of body	Males	Females	Total
Head, skull, hair, temple.....	10	11	21
Face, cheek, lip, forehead, eyelids, eyelashes.....	9	14	23
Eye.....	3	2	5
Nose.....	3	0	3
Mouth, teeth, tongue, gums.....	2	0	2
Jaw, chin, neck.....	0	2	2
Chest, ribs.....	1	2	3
Arm.....	3	11	14
Elbow.....	1	2	3
Hand, wrist.....	14	24	38
Finger, thumb, knuckle.....	50	127	177
Hip, abdomen, groin, buttocks.....	1	3	4
Knee.....	9	7	16
Leg, shin, thigh.....	4	8	12
Ankle.....	1	3	4
Foot.....	2	7	9
Toes.....	0	1	1
Back, spine.....	0	2	2
Multiple parts.....	3	5	8
Total.....	116	231	347

Responsibility for the injury was attributed to the injured person for 77 percent of the injuries to females and for 67 percent of those to males (table 6). Assignment of responsibility for an accidental injury is, of course, a difficult task. Adults and older children were usually considered responsible for their own injuries. For 24 injuries to children, the mother was

**Table 4. Number of injuries in males and females by type of injury, according to age group**

Age group	Cut, laceration, scratch		Pierce, puncture		Cut and bruise		Bruise		Burn from hot surface		Burn from fire		Other accidents		Total	
	Males	Females	Males	Females	Males	Females	Males	Females	Males	Females	Males	Females	Males	Females	Males	Females
0-4.....	12	8	1	0	3	4	11	11	1	2	0	0	0	0	28	25
5-9.....	20	25	1	2	2	2	9	12	0	1	0	0	3	0	36	43
10-14.....	9	7	2	0	2	2	4	5	2	0	1	0	1	1	21	15
15-19.....	3	3	0	0	0	0	0	2	0	1	1	0	0	1	4	7
20-24.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25-29.....	4	14	0	1	1	2	0	3	0	1	0	1	0	0	5	22
30-34.....	0	12	0	1	0	1	1	2	0	4	0	0	0	2	1	22
35-39.....	5	16	1	2	1	2	0	0	2	11	1	0	2	4	12	35
40-44.....	3	25	0	0	0	0	2	2	0	8	0	1	0	1	5	37
45-49.....	3	3	0	0	0	0	0	1	0	3	0	0	0	4	3	11
50-54.....	0	2	0	0	0	0	0	2	1	1	0	0	0	1	1	6
55 and over.....	0	3	0	0	0	0	0	3	0	2	0	0	0	0	0	8
Total.....	59	118	5	6	9	13	27	43	6	34	4	2	6	15	116	231

**Table 6. Number of injuries in males and females, according to responsibility for injury**

Responsibility for injury	Males	Females	Total
Same person as injured.....	78	177	255
Child or sibling under 5 years.....	1	2	3
Child or sibling over 5 years.....	11	9	20
Mother.....	9	15	24
Father.....	0	1	1
Both parents.....	4	2	6
Spouse.....	1	1	2
Neighbor or visitor.....	2	1	3
Other persons, including manufacturers.....	1	0	1
Objects.....	1	0	1
More than one classification or responsibility.....	2	8	10
Nothing or not ascertained.....	5	13	18
Not recorded.....	1	2	3
Total.....	116	231	347

listed as the person responsible, but only one father was thus implicated. Both parents were responsible for 6 injuries to children.

The most common action taken when females were injured was "change in performance of household task"; for males the most frequent action was "safety instructions to person injured" (table 7). A nonspecific category composed of such terms as "being more careful" and "being more thoughtful" was recorded for 19 injuries to males and 50 to females. "Correction of environment" was recorded for 43 of the 347 injuries. These data suggest that about 90

**Table 7. Number of injuries in males and females, according to action taken to prevent similar injuries**

Action	Males	Females	Total
Safety instructions to person injured.....	34	36	70
Safety instructions to self (when injured).....	1	8	9
Safety instructions to others than persons injured (as well as to person injured).....	6	3	9
Correction of environment.....	12	31	43
Change in performance of household task.....	21	68	89
Improvement in supervision of children.....	4	3	7
General resolve to be more careful.....	19	50	69
More than one action.....	0	1	1
Nothing.....	13	22	35
Not ascertained.....	6	9	15
Total.....	116	231	347

percent of the injuries could be attributed to practices and personal action, since for only 12 percent was the environment changed. However, the data may indicate that few persons in the home are capable of interpreting the role of environment in accident causation and of making environmental changes for prevention of injuries. The records showed that most participants seriously attempted to provide information concerning action taken to prevent similar injuries, and perhaps the recording of such information helped in developing safe practices and improving the safety of surroundings in the home.

**Summary**

In a home accident prevention project in Richland County, Ohio, the rate of injuries per person-year for 114 families was reduced from 6.2 during the first week to 1.3 during the 16th week. This finding, which parallels the reduction reported in a similar project in Washtenaw County, Mich., suggests that the recording of injuries by families may be a method useful in establishing safety patterns in the home, as well as in collecting epidemiological data.

Co-sponsored by the Mansfield-Richland County Health Department and the Mansfield Parent-Teacher Association Council, the project demonstrated a cooperative approach between an official health agency and a civic organization. The fact that no families withdrew indicates that interest in the project was sustained throughout its course.

The procedures used were both economical and practicable and could be applied in any community. They might be used profitably on a broad scale within a community or health jurisdiction.

The data obtained concerning several characteristics of accidental home injuries add to the steadily accumulating information on this problem. Such data are essential for sound planning and operation of home accident prevention programs.

**REFERENCE**

- (1) Investigation and application of home-injury survey data in development of prevention procedures. Ann Arbor, Mich., University of Michigan School of Public Health, 1953.

| *Local health officers are offered an idea that may strengthen nutrition education for food buyers at the "point of sale."*

## Nutrition at the Shopping Center

By WILLIAM H. SEBRELL, Jr., M.D.

THE nutritional quality of diets in this country has improved steadily since World War II. Yet there are further opportunities ahead. Just because we can say that the average man in the United States today obtains enough food to prevent serious deficiency disease does not mean that he is obtaining enough food of the right kind to give him optimum health, to help his children grow at their best rates, to prevent chronic disease, to protect him against the added stress of a severe illness, or to give him the extra stamina needed to produce to capacity in today's intensely competitive world.

We do not have widespread serious deficiency disease any more—but this is no reason to be complacent. Let's look for a moment at a form of malnutrition that affects at least a quarter of our population. I refer to obesity. Health officers and physicians are waging a ceaseless war against this condition.

Sellers of food, too, have a very real interest in this form of malnutrition as well as all other forms—not only a humanitarian interest, but a business interest. The fat man is fat because he eats too much; the remedy is to get him to

reduce his calorie intake until he uses up his own excess fat. Is it better business to sell him 3,500 calories as 2 pounds of sugar or to reduce his calories to 2,700 by selling him 2 pounds of sirloin steak? Or to look at the problem from another angle: If he is seriously overweight, he may die as much as 10 years earlier than he would if he were normal weight.

### Common Nutrition Deficiencies

Many remember the food business in the southern States about 25 years ago, when deficiency disease was widespread and the nutritionally sick and incapacitated largely bought molasses, grits, fatback, and collards. Compare that with the food business of the south today. Florida has become one of the great cattle raising States. We see increased livestock and dairy farming and more fruit and vegetable production all over the south.

One of the greatest needs today is better nutrition education. In a survey by General Mills (1), covering nearly 60,000 children in 38 States, it was found that diets tend to become poorer as children grow older; that 52 percent of high school girls' diets were poor; that the diets of boys were notably deficient in fruits and vegetables; that the adequacy of the child's diet relates closely to the occupation and economic status of the parent; and that adolescent girls drink far too little milk in the belief that it is fattening.

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*Dr. Sebrell, director of the National Institutes of Health, Public Health Service, presented this paper, condensed here, at the National Food Conference, Hollywood, Fla., March 3-6, 1955.*

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In a study by the agricultural experiment stations of six northeastern States (2), conducted in 1952, the diets of pregnant women, industrial workers, and students from kindergarten through colleges were judged by the same standards. The most common and serious deficiency was vitamin C; deficiencies in calcium and vitamin A also occurred frequently. In a 5-year Iowa statewide project by Dr. Eppright of Iowa State College (3), a deficiency of calcium and vitamin C was found. Most conspicuous for poor diets were the teen-age girls—a situation cited as particularly alarming because of its potential effects on the next generation. In New York State, Trulson (4) examined 3-day diet records of 10,000 children, half of them in the fourth and half in the tenth grade, and found the poorest food practices among the older girls.

Another group suspected of prevalent nutritional inadequacy is the older population, people over 65—a group which has increased twice as fast as the total population since 1900. Nutrition science, using new biochemical approaches, offers much promise against the diseases of the later years. In the aged, poor diets may result from psychological, social, or mechanical difficulties. About four-fifths of this age group live with relatives. At the family table, the aged may be handicapped by dental and digestive difficulties, and even their status with the family may affect their diet. Sometimes their nutrition is poor because of habits acquired in early life. These habits are not easily changed, and their modification must be approached with caution. Wisdom, tact, and patience are needed to promote good nutrition in this group and must be applied in all educational programs, whether the physician, nutritionist, or a public advertisement conveys the information.

### Education in the Food Store

Nutrition education is the essential link between professional knowledge and the improvement of food practices. It seeks to establish public understanding of, and demand for, a food supply adequate for optimum health—a balanced consumption of nutrients—taking into account a wide range of incomes. The physi-

cian, the nutritionist, the health officer, the scientist, and the teacher are struggling with limited resources and limited opportunity to teach good nutrition to the individual.

The housewife learns from these sources that good nutrition can help make her pregnancy successful, her baby healthy, and its growth good—that health, vitality, and long life are not attainable without good nutrition. It is usually her responsibility to buy the food for her family. And where does she make this final day-to-day decision? Frequently in the food store and the market. And what guidance does she get at the point of sale to help make her purchases fit with what she has been taught? None. And what help does she get to satisfy her that she is carrying out her responsibility? None. She is faced with a new set of values as she walks through the market deciding what she will buy—a comparison of prices, of sizes and weights, of quality, beautifully, colorfully, and as effectively done as modern sales techniques can do. But she receives no guidance whatever.

Let me point out where we have failed. I have just mentioned the extensive studies that have shown deficiencies in vitamin C, calcium, and vitamin A. Most food sellers would know what foods to tell families to buy in the store to combat these deficiencies. But they are missing a great opportunity for using that knowledge.

Many millions of dollars every year go into the pockets of food faddists with special food items to sell—items that may range from dried seaweed to blackstrap molasses supposed to possess extraordinary food values of some kind. The success of the food faddist in recent years is an indication of our partial failure in sound nutrition education for the general public. The food faddist's methods are insidious, yet effective. As a lecturer, a pamphleteer, a propagandist, he sells the story that the American diet is deficient, that many common foods are harmful or dangerous, that malnutrition is widespread, that most of us suffer some ailment as a result, that we must radically change our diets to regain health and to avoid disease in the future—and, of course, we must use plenty of his special food items.

It is hard to believe that so transparent an argument could be successful, but it has been.

The regulatory agencies such as the Federal Trade Commission, the Food and Drug Administration, and the Post Office Department are doing what they can to control false and misleading advertising. But the only permanent answer is a planned education campaign—one that teaches by truth, logic, and repetition the correlation between food, nutrition, and health.

If we could educate the people in the fundamentals of good nutrition, they could be led to spend their money on good food in the market and on proper dietary supplements that would do them the most good.

Many outlets are now being used to good purpose, but we are failing to use one of the best avenues for putting the message across where it really counts—where food is displayed and sold.

We will never have a really successful program until the food sellers and the food industries cooperate with the scientists, nutritionists, and teachers in developing a positive, aggressive, coordinated program to present basic nutrition facts clearly and simply to the Amer-

ican housewife, so that she can use those facts at the point of sale for the best nutrition for her family.

I am sure that if some such plan could be evolved it would prove to be good business practice and at the same time make a significant contribution to public health.

#### REFERENCES

- (1) General Mills, Inc.: What do children eat? Minneapolis, Minn., The Corporation, 1951, 31 pp.
- (2) University of Rhode Island Agricultural Experimental Station: University of Rhode Island cooperative nutritional status studies in the northeast region. IV. Dietary findings. Northeast Regional Publication No. 11. Bull. 319. Kingston, The University, June 1952.
- (3) Practice of public health, 1954. [PHR conference report of the 82d annual meeting of the American Public Health Association, Buffalo, N. Y., Oct. 11-15, 1954] Pub. Health Rep. 70: 177, February 1955.
- (4) Trulson, M., Hegsted, D. M., and Stare, F. J.: New York State nutrition survey, I, II, and III. J. Am. Dietet. A. 25: 595, 669, 764 (1949).

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## Housing Rehabilitation in Disasters

The Department of Health, Education, and Welfare has recently developed jointly with the American National Red Cross a plan by which commissioned engineer officers of the Public Health Service will assist the Red Cross in emergency housing rehabilitation activities at times of natural disasters.

Red Cross rehabilitation of buildings damaged by disasters requires on-the-spot assessment of the damage, estimates of costs of restoration, preparation of specifications for restoration, arranging for bids from contractors, and inspection and certification of the contractor's work. The Red Cross maintains a permanent staff of 10 regional building disaster experts, plus a small reserve. The Public Health Service will at times of disaster assign to the Red Cross reserve sanitary engineer and sanitarian officers competent in the

housing field. A few regular officers also will participate. All reserve officer participation will be on a voluntary basis.

The Public Health Service will develop, as a "housing component" of its inactive engineer reserve, a group of from 50 to 70. Approximately 20 will be selected for assignment to a 10-day training course in August 1955 on housing construction, cost estimating, and Red Cross policies and procedures. All members of the housing component of the reserve will periodically receive information on the subject of emergency housing rehabilitation from the Red Cross and Public Health Service. Also, additional training courses will be provided.

The Red Cross will pay all travel and per diem costs for participating PHS officers for training or for disaster relief work.

# Practical Problems in Rabies Control

At the annual meeting of the American Public Health Association in Buffalo, October 11, 1954, the Conference of Public Health Veterinarians held a panel discussion on recent advances in rabies control. Current methods and problems in rabies control were touched on through a simple and effective device which gave the discussion unity—the story of the prevention of an imaginary rabies outbreak in an imaginary country. The essentials of the discussion follow.

**KOPROWSKI:** The events forming the basis for discussion during the present session occurred in June 1954 in the State of Simona of the Republic of Neutralia. I may add that Neutralia (with thanks to Evelyn Waugh) is imaginary and composite and represents no existing nation.

Two large dogs attacked a group of 13 children returning from school. Although all the children came into contact with the animals, some suffered only minor wounds or scratches, while severe wounds of the head and neck were inflicted by the biting animals on other children. Passersby and school teachers, alarmed by this savage and unprovoked attack, called police. Several policemen appeared on the scene immediately, and, as Neutralia permits the carrying of firearms, one of the men shot one of the biting dogs through the head because the animal could not be subdued. The other dog was taken into custody.

Before we start our discussion of these events, I would like to acquaint you briefly with the State of Simona. It comprises an area of 45,000 square miles of land and about 1,500 square miles of inland water.

Farm acreage accounts for about 65 percent of the land area, and

many farm and domestic animals are kept, including large stocks of dairy cows. In the 25 percent of the country covered by dense forest, there is an abundance of wildlife—foxes, coyotes, beavers, wolves, deer, and so forth. Bats are also quite prevalent in this woodland as well as in the inhabited parts of the state.

Simona has a democratic, progressive government and a well-organized department of health and animal husbandry in the capital. The population of 12 million inhabitants is known for its fondness for domestic pets, particularly dogs, and there is, therefore, a large dog population.

Simona was supposed to be free from rabies during the period 1946–54. However, in all adjoining territories, and particularly in the neighboring State of Granchester, the disease had always existed in enzootic form so that the danger of infection being introduced was constantly present.

Now, after giving you this incomplete and sketchy information concerning the State of Simona, I would like to return to the accident which befell the children and ask the members of the panel some questions.

Did the policeman who shot the dog through the head act wisely?

What should have been done with the living dog? Dr. Tierkel?

## On Clinical Evidence

**TIERKEL:** It's too bad the policeman shot the dog through the head. He should have shot him through the heart since shooting through the head damages the brain and makes it less useful for diagnosis. The dead dog's head should be sent to the laboratory for examination for Negri bodies.

If it is possible to capture the biting animal, the apprehended dog should be watched for 7 to 10 days by a qualified observer to see if the animal shows clinical signs of rabies.

Most important, the captured dog should be allowed to die a natural death from the disease if he has it in order to increase the chances that his brain, on examination, will disclose fully developed Negri bodies.

The head should be removed, packed with ice in a watertight double container and sent to the public health laboratory by the fastest means of transportation. It should not be frozen because freezing often distorts and tears the structure of the tissues, making the examinations difficult.

## Panel Members

Moderator of the panel discussion on rabies control was Dr. Hilary Koprowski. He is assistant director of viral and rickettsial research for the research division, American Cyanamid Company, Pearl River, N. Y.

The panel members were: Dr. Donald J. Dean, veterinary consultant, New York State Department of Health; Dr. Leland E. Starr, public health veterinarian, Georgia State Department of Public Health; and Dr. Ernest S. Tierkel, director, Rabies Control Activities, Communicable Disease Center, Public Health Service, Atlanta.

Also participating, toward the close of the discussion, were Dr. John P. Fox, professor of epidemiology, department of tropical medicine and public health, Tulane University of Louisiana School of Medicine; and Dr. T. F. Sellers, director, Georgia State Department of Public Health.

Of course, absence of Negri bodies in the brain does not conclusively prove that the dog is free from rabies. If there are no Negri bodies, one grinds up samples from various parts of the brain in a 10 percent suspension and injects this into the brains of mice to see if these test animals will become infected.

In practice, 10 to 15 percent of routine Negri-negative canine brains turn out to be positive on the mouse tests. It's a good idea to do a general autopsy of the dog but not if it delays shipment of the head to the public health laboratory.

Another point—the submaxillary salivary glands should be dissected from the head and shipped to the laboratory so that a test can be made for the presence of rabies virus in the saliva. Again, that is done by inoculation of a 10-percent suspension of the salivary glands into mouse brain. To preclude other encephalitides, a serum neutralization test is made with the virus isolated in mice. This procedure definitely establishes whether rabies is present.

DEAN: Fifteen to twenty-five percent of the dog heads examined annually in upstate New York prove rabid. Diagnosis is made in 95 to 98 percent of the rabies cases through finding typical Negri bodies in impression smears or sections of

the dog's brain. The remainder are established as rabid by mouse inoculation tests. All street virus strains isolated in New York State to date have been negrigenic. Fixed rabies strains, on the other hand, early lose the ability to produce Negri bodies.

KOPROWSKI: Some African strains of rabies virus do not elicit formation of Negri bodies.

DEAN: Another problem in diagnosis is the presence of inclusions similar to Negri bodies when rabies doesn't exist—false positives. These structures are artifacts or inclusions associated with other viral diseases. They are particularly common in cats and raccoons. This is important since with hyperimmune antirabies serum decisions on human treatment have to be made earlier.

KOPROWSKI: The necessary steps, then, in determining whether rabies is present in a biting animal may be briefly outlined:

First, a period of observation by a qualified observer.

Second, general autopsy when the animal dies or is killed following clinical signs of rabies, with the use of good pathological procedures.

Third, shipment of the head, packed in ice but not frozen, to a suitable laboratory; or shipment of brain tissue and salivary glands, in glycerol-saline solution.

Fourth, laboratory diagnosis with (a) proper staining to reveal the pathognomic Negri bodies, which are sometimes hard to differentiate from nonrabies inclusions; (b) the inoculation of mice with brain suspensions which have been treated with penicillin or streptomycin, the observation of mice for sickness or death, and the examination of mouse tissues for Negri bodies; and (c) accurately performed serum neutralization tests.

Following these procedures, one of the biting dogs in Simona was diagnosed as suffering from rabies, and in all probability his saliva at the time of the attack upon the children was infectious. We shall return later to the outline of treatment of the children.

Meanwhile, we have to report regretfully that within 2 weeks several more confirmed cases of rabies in dogs were reported from other areas of Simona. After that the spread was rapid, and the disease was not confined to dogs. By the end of September the following cases of rabies had been recorded: 79 dogs, 14 cattle, 8 cats, 2 horses, 3 sheep, 7 foxes, and 1 deer. Almost all counties of the state were affected. What control methods were to be adopted by the State of Simona Public Health Department?

## On Dog Vaccination

DEAN: There are two problems: canine rabies, to be solved by vaccination and dog control, and the more complex problem involving rabies in wildlife and farm and domestic animals other than the dog.

Dog control should obviously be tightened although this is difficult to achieve in rural areas. One should next vaccinate as many dogs as possible so as to impose a barrier of immune dogs between infected wildlife and man. Experience has shown that if 70 percent of the dog population is vaccinated, rabies can be controlled.

Two effective vaccines are available. One contains killed virus produced in mammalian brain tissue; it will afford protection for 1 year.

The other, the Flury strain of modified live virus rabies vaccine, produced in embryonated hen's eggs, protects for 4 years, and possibly for life. We have had extensive field experience since 1946 with both types of vaccine.

In upper New York State, where wildlife rabies is endemic in approximately one-third of the area, and where 314 to 1,175 laboratory confirmed cases have been reported annually since 1944, canine rabies has been dramatically controlled since the dog program was initiated early in 1946. We had 233 rabid dogs in 1944, 503 in 1945, and 377 in 1946, the year our control program started. Since then we have had only 16 to 48 annually despite the widespread and continuing wildlife infection.

From 1946 through 1949, brain tissue vaccine was the only product available for rabies prophylaxis. Its use declined during 1950 and 1951. In this period the attack rate for nonvaccinated dogs was 3 to 11 times as great as that for dogs vaccinated with killed virus rabies vaccine.

The modified live virus vaccine was first used in two of our counties in 1950. Its use grew steadily. It has been the only vaccine used in all county vaccination programs since 1952.

The greatest advantage of the modified live virus vaccine is that it confers more profound and more enduring immunity than the killed virus product. We have had fewer vaccination failures.

Of the rabid dogs reported in upstate New York since the rabies control program started in 1946, 82, or 13 percent, of the dogs were previously immunized with brain tissue vaccine. Of these animals, 52 died of rabies more than 1 month but less than 3 years after vaccination. In contrast there have been only 2 vaccination failures and 1 vaccine death among the 200,000 dogs that have been given the chick embryo product.

It is more effective and cheaper to vaccinate individual dogs every 4 years. Successful annual vaccination is difficult to achieve, particularly in areas where rabies does not exist or where infection is minimal.

Another advantage of modified live virus vaccine is that it appears to be safer for injected dogs. Most of us have witnessed untoward neurological side reactions in occasional animals given the killed virus vaccine. In the absence of controlled studies the exact incidence is unknown, but it is probably in the order of 1 to 3,000 or 1 to 5,000 animals injected.

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I think that all members of the panel agree that these are important parts of the framework of a rabies control program. But there is another very important part—the reduction of rabies in wildlife.

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scanty. Reporting in wild animals is improving but is obviously sketchier than reporting in dogs and cattle. In New York State we have had rabies in dogs since the early colonial era, but only recently have we recognized the disease in wildlife. We do not think that the upsurge in wildlife rabies is just a matter of better reporting. We think there has been an actual increase. Just why is the \$G4 question.

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smaller segments of time, the minimal period can be determined.

*Time must be accurately recorded.* In most time studies, the starting time and the total time for each activity are recorded in appropriate columns. Although this technique is satisfactory, the Yale project found that a time bar was simpler for participants to use and worked just as effectively.

*Participants must code their own activities.* Theoretically, it would be better for participants to record their activities in narrative form and for the research staff to code the activities. In practice, however, it proved impossible in the Yale project to secure narrative time logs from most public health workers in sufficient detail to permit adequate analysis.

*The system of classification must be simple.*

If the workers are expected to classify and code their own activities, the categories must be relatively few in number and so clearly defined that, after proper instruction and a trial run, the workers can classify their activities with ease and without appreciable error. Further analysis of any one category of activities can be made by the research staff, if detailed activity inventories of the workers are obtained simultaneously through interviews, and if the activity inventory classification is related to the time-study classification. Ultimately, such analyses were possible in the Yale project.

### Initial Developmental Efforts

Answers to two questions were fundamental to the conduct of the time study. What infor-

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## List of Activity Categories

1. **Other Agencies.** (Not joint program planning, which is No. 9.) Organizing and participating in the planning of relationships with, and securing support for program from, other agencies and officials. Examples: hospitals, voluntary agencies, boards of education, mayor, legislature, civil service, finance department, welfare agencies, health departments at same level.

2. **Other Health Departments.** (Not at same level, which is No. 1.) Organizing and participating in the planning of relationships and consulting with health departments at different governmental levels. Examples: planning for financial support, exchange of services or personnel, joint programs.

3. **Giving Professional Education.** (Not inservice, which is No. 17 and No. 18.) Planning, organizing, participating in the giving of professional education. Examples: preparing, organizing and conducting workshops, formal classes in colleges and professional schools, lectures at professional societies.

4. **Group Organization.** Planning for, organizing, and training specific purpose groups. Examples: X-ray survey committees, fact-finding groups, study groups, volunteers in clinics.

5. **Talks to Public.** Planning, preparing, and delivering talks to public. Examples: mothers' classes, high schools, service clubs, PTA's, food handlers.

6. **Planning Mass Media.** (Not its preparation, which is No. 10.) Planning content and employment of mass media of communication. Examples:

audiovisual aids, pamphlets, newspaper publicity, radio scripts.

7. **Information Service.** (Not as part of case visit, which is No. 10.) Answering individual requests for information and escorting visitors through the health department.

8. **Health Department Program Planning.** Within the health department, planning research into health needs and planning the initiation, revision, scope, methods of execution, operating policy, and evaluation of health programs.

9. **Joint Program Planning.** Working with other agencies to plan research into health needs and to plan the initiation, revision, scope, methods of execution, operating policy, and the evaluation of health programs.

10. **"Technical."** (Not arithmetic computations, posting, adding and transcribing reports, distributing mass media, which are No. 11.) Primary medical, professional, technical activities such as:

Examination and treatment of patients, home visits, environmental sanitation visits, advice to clients and patients, taking medical and social histories, epidemiological investigations.

Laboratory and other test procedures, reading X-rays, preparation of mass media, planning and editing the annual report, preparing budgets and diets, statistical analysis.

11. **"Ancillary."** (Not giving information to clients, which is No. 7.) Essential supporting activities, such as:



mation was the time study to elicit? How was the desired information to be obtained?

The initial plan was to match with time allocations the detailed activity information obtained from interviews and observation. The information was to be obtained from time kept by participants in their own words.

Toward the end of 1950, the first formulation of time-study content and method was completed.

A time-log form was designed to describe what activities a public health worker does, how the worker performs them, and approximate time involved. It consisted of columns: a narrow left-hand column in which time intervals were specified and 11 columns, one headed "What: Job Activity," and the other, "How: Means."

Instructions for the use of the log

suggested simply that each activity be recorded in terms of what, how, and how long. A partial list of activities and the way in which these activities might be performed was furnished as a guide. The list named about 60 possible activities, such as investigation, survey, clinic examination, sample collection, and school visit, and about 50 areas in which these activities could be performed, such as tuberculosis, civilian defense, epidemiology, and venereal disease. Coding and analysis of the completed time logs were to be performed by the research staff in accordance with the basic activity codes developed for the interview part of the project.

A pilot run of this time study, including careful orientation of the participants, was undertaken in one local health department. The inadequacies of this approach were soon appar-

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### List of Activity Categories—Continued

at clinic and obtaining identifying data (name, address, etc.) from clients. All keeping, compilation of reports, filling out of forms (includes daily charting).

Education, media making, issuing of orders and developing X-rays.

Distributing mass media, filing, geographing, opening and distributing mail, transferring and making appointments.

Management. (Not activities with clients, which are No. 1 and

orders, keeping accounts, reports, performing computations.)

1.) Planning, preparing, the budget. Examples: with vendors, planning projects, authorizing purchases, opening accounts, allotting funds.

Management. Planning and "keeping" activities.

Filing report, record, construction and providing services; building

Supervising performing, selecting, and authorizing activities: interview-standards,

reviewing credentials, recommending or giving disciplinary action, counseling re personal problems or vocational guidance, writing letters of recommendation.

15. Personnel Supervision. (Not training, which is No. 17.) Giving immediate personal direction to a staff member. Examples: giving assignments, review through observation, discussions, analysis of records or reports.

16. Receiving Supervision. Receiving the services described in No. 14 or the supervision described in No. 15.

17. Individual Inservice Training. Planning, organizing, and giving inservice training and education for individuals. Examples: conferences, close collaboration, field trips, provision of study outside the department.

18. Group Inservice Training. Planning, organizing, and giving inservice training and education for groups of workers. Examples: lectures, staff meetings, field trips.

19. Own Education and Training. Attending professional meetings, classes, workshops, staff meetings; reading professional literature; field orientation; receiving inservice training.

20. Social Activities. Achieving and maintaining rapport with co-workers, "passing the time of day," social conversations, arranging for office parties.

21. Personal. Meals, coffee hours, rest periods, sick leave, dentist and doctor appointments.



The other, the Flury strain of modified live virus rabies vaccine, produced in embryonated hen's eggs, protects for 4 years, and possibly for life. We have had extensive field experience since 1946 with both types of vaccine.

In upper New York State, where wildlife rabies is endemic in approximately one-third of the area, and where 314 to 1,175 laboratory confirmed cases have been reported annually since 1944, canine rabies has been dramatically controlled since the dog program was initiated early in 1946. We had 233 rabid dogs in 1944, 503 in 1945, and 377 in 1946, the year our control program started. Since then we have had only 16 to 48 annually despite the widespread and continuing wildlife infection.

From 1946 through 1949, brain tissue vaccine was the only product available for rabies prophylaxis. Its use declined during 1950 and 1951. In this period the attack rate for nonvaccinated dogs was 3 to 11 times as great as that for dogs vaccinated with killed virus rabies vaccine.

The modified live virus vaccine was first used in two of our counties in 1950. Its use grew steadily. It has been the only vaccine used in all county vaccination programs since 1952.

The greatest advantage of the modified live virus vaccine is that it confers more profound and more enduring immunity than the killed virus product. We have had fewer vaccination failures.

Of the rabid dogs reported in upstate New York since the rabies control program started in 1946, 82, or 13 percent, of the dogs were previously immunized with brain tissue vaccine. Of these animals, 52 died of rabies more than 1 month but less than 3 years after vaccination. In contrast there have been only 2 vaccination failures and 1 vaccine death among the 200,000 dogs that have been given the chick embryo product.

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by rabies, the experiment was inconclusive except to show that on this round the aviauzed rabies vaccine did not harm the animals.

We then purchased cattle, inoculated them, and challenged with rabies. Five of the 16 vaccinated cows died, but 12 of the 16 unvaccinated cows died of rabies.

It should be noted that the 5 deaths occurred in animals which had been vaccinated as calves. All animals vaccinated as adults survived challenge. This indicates that the immunity induced is not as solid in young adults and that young animals should be revaccinated.

KOPROWSKI: While all these control measures were being discussed in Simona, rabies spread through wildlife species to an alarming degree. In two places bats were reported to have attacked children. However, before we go over to the bat problem, it is perhaps advisable to discuss a comprehensive program of ecologic studies aimed at elucidating the following points:

How many species are involved?

Is there a possibility of silent carriers?

Do all animals infected with street virus die?

TIERKEL: As Dr. Dean has mentioned, one of the first problems we must attempt to solve is a quantitative relationship between population density of wild animal vectors, such as foxes, and prevalence of the disease in those populations. We must find the population density threshold which will no longer support a rabies epizootic.

The bizarre geographic and cyclic pattern of sylvatic rabies outbreaks has suggested to some the possibility of a symptomless carrier state in foxes and skunks. Along this line, information must be obtained on whether there is natural immunity and recovery in these animals.

Still others feel that there may be unknown reservoirs of rabies in the wild, such as in various species of small mammals which may have been overlooked. This also suggests a possibility that there may be other routes of transmission in wild animals.

Other problems which should be studied are velocity of the geographic movement of infection and the relationship of bat rabies to the disease in terrestrial animals.

### On Bat Rabies

KOPROWSKI: What about bat rabies?

The two bats which were caught in Simona after attacking children were forwarded to the nearest public health laboratory and subjected to diagnostic studies. Mice inoculated with their brain or salivary gland tissue developed rabies.

TIERKEL: Many bat species are turning up rabid. It started in 1953 when a Florida yellow bat attacked a child. Then in Pennsylvania a woman was attacked by a different species of bat. These episodes aroused the interest of public health workers in many areas and prompted surveys throughout the country.

Thus far, rabid bats have been found in Florida, Pennsylvania, Texas, California, and Montana. Over 40 isolations have been made from 6 different species of insectivorous bats of free-living and colonial or cave-dwelling varieties.

In Texas, Lt. Col. Kenneth F. Burns reports that 65 percent of 207 pooled bat serums showed rabies antibodies by serum neutralization test. There is much research work that needs to be done to determine the epidemiological significance of these findings.

KOPROWSKI: It's hard to recognize rabid bats since we don't know what to expect in the behavior of a normal bat. According to Colonel Burns, it's hard to distinguish the way bats act when rabid from the effect of DDT, which also affects the nervous system.

Are insectivorous bats as great a menace to the animal population as the hematophagous species?

Is there evidence for symptomatic carriage in bats?

TIERKEL: We do not have enough clinical experience with bats so we must rely on laboratory findings. It has been observed that when vampire bats in Latin America are rabid they often fly in the daytime instead

of at night. On the other hand, vampires are capable of transmitting rabies to people and animals without showing visible signs of illness. We have yet to discover whether this is true of the rabid insectivorous bats found in the United States.

DEAN: Anything we say about the bat problem is premature. We first thought that only free-living bats were infected but then found rabies in colonial bats as well.

There are two schools of thought. One group thinks that bat rabies in this country represents an extension of the disease from Mexico, Trinidad, or South America, the invasion of a new disease among bats in the United States. Rabies among vampire bats south of the border is an old problem. In this connection migratory bats have been tagged traveling as far as 800 miles. There is a banding program under way to check this. Another group feels that rabies in bats has existed in this country for many years. Knowledge concerning bats and bat rabies is grossly inadequate.

We note that there is an unusually long incubation period in bat rabies with the Florida experience indicating that clinical illness lasts longer before death than in other species. We don't know how bats get the disease except from other bats, but we do know that they pass it on to other species. Unprovoked attacks by rabid bats suggest that they have undergone mental changes.

SELLERS: The finding of infected bats in so many widely separated areas of this country seems to me to strongly indicate that rabies has been in our bats for a long time.

KOPROWSKI: To summarize our knowledge of bat rabies, then:

All bats are suspect, insectivorous as well as hematophagous.

Brain and salivary gland tissue of any bat which attacks a human being should be studied in a laboratory for the presence of rabies virus.

Colonel Burns' finding of rabies antibodies in blood pools of asymptomatic bats caught in enzootic areas, a finding which should be confirmed by other workers, suggests that bats may be a reservoir of the disease.

## On Human Prophylaxis

**KOPROWSKI:** Now we have to return to the treatment of the children who were bitten in Simona. What should be done?

Since time is getting short, I would like to limit our remarks on human treatment to two items: first, the use of antiserum, and, second, preliminary results with chick embryo vaccine.

**SELLERS:** Georgia has been using rabies antiserum since 1948. We've given it to 60 or 70 individuals, limiting its use to those with severe bites on the face, neck, or hands, and to cases where the exposures were not more than 48 hours old. In all instances the antiserum was followed by appropriate courses of antirabies vaccine, and during this time there were no deaths among those receiving vaccine alone. We therefore have no convincing field evidence of the part played by antiserum in protection. The laboratory protocols, however, are very convincing, and I definitely endorse the use of antiserum in principle.

**DEAN:** Hyperimmune serum promises to be of value. Since the serum is of equine origin, however, it possesses the hazards inherent in products of this nature. We have observed two serious cases of serum sickness among 35 treated individuals.

**FOX:** At Tulane University, we have been trying the live Flury virus vaccine in prisoner volunteers to see if it can be used to replace current forms of the Pasteur treatment. The volunteers cooperating are inmates of the Mississippi and Louisiana State prisons. All of our work has been with high-passage virus, about 180th passage level, although 3 or 4 years previously Dr. Koprowski used the low-passage

virus, now used for dogs, in about 30 persons. In all, we have given one or more inoculations of this virus to about 170 or 180 persons, and one important fact is that we have observed no adverse effects.

The more important point, however, is that, although we know the Flury virus vaccine works well in dogs, we are still trying to find out if it does in man. A single injection of two dog doses does not induce development of detectable neutralizing antibody. However, it apparently has some effect because a second booster injection of equivalent size usually does produce antibody. Increasing the amount of virus inoculated by giving multiple doses often, and in proportions increasing with the amount, gives rise to antibody. Because of this we feel that the Flury virus probably does not multiply in man, at least when placed extraneurally.

The question arises at this point as to whether demonstrable antibody is essential to the protection of man. Without challenge experiments this cannot be answered. Our feeling is that appearance of antibody is our only possible index of success and that, before we can recommend Flury virus vaccine in place of currently accepted vaccines, we must find a way of using it that will result in as uniform an appearance of antibody as that following current forms of Pasteur treatment. Our goal, of course, is an effective vaccine free from the risk of neuro-paralytic accidents.

Currently, we are working with small intramuscular or intradermal inocula. Fairly good results have followed a schedule of 4 doses, 5 days apart. We are now trying more doses with a shorter interval. Because in giving the Pasteur treatment one is working against time, we

have set 15 days as the maximum length of a practical dose schedule, even though we have evidence that good results follow as few as 2 inoculations spaced 30 days or more apart. Also, since vaccine may have to be given together with hyperimmune serum, we are trying to determine whether the active response to vaccine is altered by the presence of passively acquired antibody.

**DEAN:** The use of the Flury strain in man is still in the experimental phase. It is important also that we emphasize presently approved methods of treatment. Thorough local treatment of wounds with 1 percent aqueous zephiran or 20-percent soap solution remains of paramount importance. Local treatment should be followed by a series of injections of brain tissue vaccine containing killed virus with or without the use of hyperimmune serum.

**KOPROWSKI:** I would like to tell you about the results of the use of antiserum in Iran last summer. In August, a rabid wolf (the virus was isolated from the animal's brain after its death) bit 27 people, of whom 17 received severe head and neck bites. Of the 5 persons who received Semple type vaccine alone, 3 died, while of the 12 persons receiving serum and vaccine, only 1 died. One child, who had a penetrating wound of the head and direct exposure of the brain to the saliva of the biting animal, survived—he was given 6 injections of serum at 2-day intervals, followed by vaccine.

Thus, we are leaving Simona and Neutralia and hope that when we return next year rabies will be eradicated. I should remind you, however, about the epigram of Jerrold concerning hope. "In all the wedding cake, hope is the sweetest of the plums."

P  
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R

smaller segments of time, the minimal period can be determined.

*Time must be accurately recorded.* In most time studies, the starting time and the total time for each activity are recorded in appropriate columns. Although this technique is satisfactory, the Yale project found that a time bar was simpler for participants to use and worked just as effectively.

*Participants must code their own activities.* Theoretically, it would be better for participants to record their activities in narrative form and for the research staff to code the activities. In practice, however, it proved impossible in the Yale project to secure narrative time logs from most public health workers in sufficient detail to permit adequate analysis.

*The system of classification must be simple.*

If the workers are expected to classify and code their own activities, the categories must be relatively few in number and so clearly defined that, after proper instruction and a trial run, the workers can classify their activities with ease and without appreciable error. Further analysis of any one category of activities can be made by the research staff, if detailed activity inventories of the workers are obtained simultaneously through interviews, and if the activity inventory classification is related to the time-study classification. Ultimately, such analyses were possible in the Yale project.

### Initial Developmental Efforts

Answers to two questions were fundamental to the conduct of the time study. What infor-

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## List of Activity Categories

1. Other Agencies. (Not joint program planning, which is No. 9.) Organizing and participating in the planning of relationships with, and securing support for program from, other agencies and officials. Examples: hospitals, voluntary agencies, boards of education, mayor, legislature, civil service, finance department, welfare agencies, health departments at same level.

2. Other Health Departments. (Not at same level, which is No. 1.) Organizing and participating in the planning of relationships and consulting with health departments at different governmental levels. Examples: planning for financial support, exchange of services or personnel, joint programs.

3. Giving Professional Education. (Not inservice, which is No. 17 and No. 18.) Planning, organizing, participating in the giving of professional education. Examples: preparing, organizing and conducting workshops, formal classes in colleges and professional schools, lectures at professional societies.

4. Group Organization. Planning for, organizing, and training specific purpose groups. Examples: X-ray survey committees, fact-finding groups, study groups, volunteers in clinics.

5. Talks to Public. Planning, preparing, and delivering talks to public. Examples: mothers' classes, high schools, service clubs, PTA's, food handlers.

6. Planning Mass Media. (Not its preparation, which is No. 10.) Planning content and employment of mass media of communication. Examples:

audiovisual aids, pamphlets, newspaper publicity, radio scripts.

7. Information Service. (Not as part of case visit, which is No. 10.) Answering individual requests for information and escorting visitors through the health department.

8. Health Department Program Planning. Within the health department, planning research into health needs and planning the initiation, revision, scope, methods of execution, operating policy, and evaluation of health programs.

9. Joint Program Planning. Working with other agencies to plan research into health needs and to plan the initiation, revision, scope, methods of execution, operating policy, and the evaluation of health programs.

10. "Technical." (Not arithmetic computations, posting, adding and transcribing reports, distributing mass media, which are No. 11.) Primary medical, professional, technical activities such as:

Examination and treatment of patients, home visits, environmental sanitation visits, advice to clients and patients, taking medical and social histories, epidemiological investigations.

Laboratory and other test procedures, reading X-rays, preparation of mass media, planning and editing the annual report, preparing budgets and diets, statistical analysis.

11. "Ancillary." (Not giving information to clients, which is No. 7.) Essential supporting activities, such as:

mation was the time study to elicit? How was the desired information to be obtained?

The initial plan was to match with time allocations the detailed activity information obtained from interviews and observation. The time information was to be obtained from time logs kept by participants in their own words.

Toward the end of 1950, the first formulation of time-study content and method was completed. A time-log form was designed to determine what activities a public health worker performs, how the worker performs them, and the approximate time involved. It consisted of three columns: a narrow left-hand column in which fixed time intervals were specified and two broad columns, one headed "What: Job Duty or Activity," and the other, "How: Means Employed." Instructions for the use of the log

suggested simply that each activity be recorded in terms of what, how, and how long. A partial list of activities and the way in which these activities might be performed was furnished as a guide. The list named about 60 possible activities, such as investigation, survey, clinic examination, sample collection, and school visit, and about 50 areas in which these activities could be performed, such as tuberculosis, civilian defense, epidemiology, and venereal disease. Coding and analysis of the completed time logs were to be performed by the research staff in accordance with the basic activity codes developed for the interview part of the project.

A pilot run of this time study, including careful orientation of the participants, was undertaken in one local health department. The inadequacies of this approach were soon appar-

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### List of Activity Categories—Continued

Preparation for clinic and obtaining identifying information (name, address, etc.) from clients. All record and report keeping, compilation of reports, designing and filling out of forms (includes daily time log), car servicing.

Glassware preparation, media making, issuing of biologicals, taking and developing X-rays.

Issuing supplies, distributing mass media, filing, taking dictation, mimeographing, opening and distributing and sending out mail, transferring and placing telephone calls, making appointments.

**12. Financial Management.** (Not activities with other agencies or officials, which are No. 1, and not processing purchase orders, keeping accounts, preparing financial statements, performing computations, which are No. 11.) Planning, preparing, justifying, and controlling the budget. Examples: planning initial purchases with vendors, planning cost studies, discussing budget plans, authorizing purchases or adjustments between accounts, allotting funds, reviewing financial statements.

**13. Gerieral Services Management.** Planning and controlling organization "housekeeping" activities. Examples: planning and controlling report, record, and filing systems; space usage, construction and installations; custodial and grounds services; building and equipment repair.

**14. Personnel Management.** (Not supervising personnel, which is No. 15.) Recruiting, selecting, transferring, counseling personnel; and authorizing vacation, leave, and travel. Examples: interviewing candidates, preparing qualification standards,

reviewing credentials, recommending or giving disciplinary action, counseling re personal problems or vocational guidance, writing letters of recommendation.

**15. Personnel Supervision.** (Not training, which is No. 17.) Giving immediate personal direction to a staff member. Examples: giving assignments, review through observation, discussions, analysis of records or reports.

**16. Receiving Supervision.** Receiving the services described in No. 14 or the supervision described in No. 15.

**17. Individual Inservice Training.** Planning, organizing, and giving inservice training and education for individuals. Examples: conferences, close collaboration, field trips, provision of study outside the department.

**18. Group Inservice Training.** Planning, organizing, and giving inservice training and education for groups of workers. Examples: lectures, staff meetings, field trips.

**19. Own Education and Training.** Attending professional meetings, classes, workshops, staff meetings; reading professional literature; field orientation; receiving inservice training.

**20. Social Activities.** Achieving and maintaining rapport with co-workers, "passing the time of day," social conversations, arranging for office parties.

**21. Personal.** Meals, coffee hours, rest periods, sick leave, dentist and doctor appointments.



ent. The participants found it extremely difficult to relate their activities to the fixed time intervals on the log and to identify the what and the how of the activities in a few short words or phrases. In addition, the participants attempted to fit their own activities into the suggested list, with resulting distortion and inaccuracy in their reporting.

In an attempt to remedy these faults, the time study was revised early in 1951 in the direction of a more nondirective instrument. The time-log form and the instructions were modified to give the recorders more freedom, and codes were developed especially for the time study. Coding and analysis were still to be done by the research staff. This edition of the study was administered to the personnel of health departments in Michigan, and the returns revealed that the information was adequate only for an analysis of time distribution by program. It was not possible to classify the activities according to the nature of the activity or the persons or organizations with whom the activity was performed, as had been planned. (The method and findings of this portion of the study are reported in a separate article, which appears on p. 577 of this issue.)

Since the primary objectives of the time study had not yet been accomplished, further explorations into content and method were undertaken. One of these was an attempt to develop a code based on classification of public health activities according to level of difficulty. Five levels were established, and an effort was made to allocate the hundreds of individual activity items to these levels. Difficulties were soon encountered. Agreement as to the proper level of difficulty for some of the activity items could not be reached. The number of items which had to be included if coding was to be uniform was tremendous. The most important factor in the decision to abandon this approach, however, was the growing realization that it would probably prove impossible to obtain narrative time records in sufficient detail for accurate classification.

At this stage of the study, it became evident that two major difficulties were blocking its effective execution. One was the emphasis on the differences among the several types of public

health personnel, with the resultant development of a different, very detailed code for each type. The other was the impossibility of obtaining narrative reports of sufficient clarity and in sufficient detail to permit classification into the hundreds of activity code items.

### The Final Method

From this experience, the project staff concluded that the narrative time study was not feasible in research of this kind, and that the investigation should be founded on the broad similarities of activity among the several kinds of public health workers. This decision required that the number of categories for classification of activities be relatively small and that the categories be clearly defined. It was felt also that the time study should give promise of yielding new knowledge. Toward these ends, an entirely different instrument was developed.

The new instrument was designed to reveal the distribution of time in accordance with a broad, functional classification of activities which cut across both programs and services. It contained 21 activity categories applicable to all public health personnel (p. 572). For purposes of analysis these categories were grouped into four major classes of activity: technical, category 10; ancillary, category 11; administration, categories 8 and 12 through 19; and community relations and organization, categories 1 through 7, and 9.

Participants were to code their activities according to the list of 21 categories and to enter the code number on a daily time log. The time log is actually a time bar, or time scale, in which time segments are delineated by drawing two vertical lines (see p. 575). The activity list, a sample time log and illustration of its use, and simple directions for recording the time data were included in an instruction booklet, which was given to each participant.

Following a pretest in a local health department, in which difficulties encountered were remedied, the time study was administered to personnel in the State health department and selected county health departments in Maryland during the fall and winter of 1952-53. The participants were asked to keep the time study daily for 2 days each month for 5 months.

# Sample Daily Time Log and Illustration of Its Use

Name R.C. Burr, MD Department Orange H.O. Date June 15, 1952

AM

12 - 2	12:00 15 30 45 1:00 15 30 45 2:00
2 - 4	2:00 15 30 45 3:00 15 30 45 4:00
4 - 6	4:00 15 30 45 5:00 15 30 45 6:00
6 - 8	6:00 15 30 45 7:00 15 30 45 8:00
8 - 10	8:00 15 30 45 9:00 15 30 45 10:00
10 - 12	10:00 15 30 45 11:00 15 30 45 12:00

PM

12 - 2	12:00 15 30 45 1:00 15 30 45 2:00
2 - 4	2:00 15 30 45 3:00 15 30 45 4:00
4 - 6	4:00 15 30 45 5:00 15 30 45 6:00
6 - 8	6:00 15 30 45 7:00 15 30 45 8:00
8 - 10	8:00 15 30 45 9:00 15 30 45 10:00
10 - 12	10:00 15 30 45 11:00 15 30 45 12:00

The following activities have been placed on the time log above:

- |             |  |             |   |
|-------------|--|-------------|---|
| 8:45- 9:00  | Sorting the mail, straightening desk, signing letters secretary typed previous afternoon (11).   | 12:00- 1:00 | Lunch (21).   |
| 9:00- 9:25  | Phone calls to manufacturers' representatives to decide type of refrigerator to purchase for lab (12).   | 1:00- 1:25  | Holding educational staff conference to report on new drug (18).  |
| 9:25- 9:45  | Letter to president of PTA about talk she wants given at organization's next meeting (5).  | 1:25- 1:45  | Interviewing candidate for staff nurse position (14).   |
| 9:45-10:00  | Visiting various sections of department (20).  | 1:45- 3:10  | Travel to Lincoln School and filling in for physician at well child conference (10).                    |
| 10:00-10:10 | Coffee (21).   | 3:10- 3:15  | Phone call from staff sanitarian seeking advice on closing restaurant (15).                             |
| 10:10-11:30 | Travel to mayor's office, meeting with him to discuss getting several agencies together to plan for medical defense service, return to office (1). | 3:15- 4:05  | Continuing well child conference and return to office (10).   |
| 11:30-12:00 | Meeting with division heads to plan civil defense program (8).   | 4:05- 5:30  | Outlining TB pamphlet with health educator (6). Then left for home.                                     |
|             |  | 6:45-10:35  | Travel to and attending medical society meeting to give talk on school health program, travel home (3). |



The days were assigned so that each part of the month and each part of the week were represented.

The time study was administered in the following manner. One or two days prior to the scheduled beginning of the first 2-day period, two of the project's staff workers, who were interviewing members of the department, held a time-study orientation session with all selected participants. These sessions lasted approximately an hour and consisted of a presentation and explanation of the time-study code, a review of samples of completed time logs, and a "dry run" in which the participants coded and recorded activities for a typical day. Discussion and questions were encouraged. Then, on the first day of the time study a member of the research staff visited each participant in order to check on procedure and to answer any questions which might have arisen.

Secretaries of health department units were made responsible for the mechanics of administering the time study after the first month. They distributed the daily time logs, collected them after they had been completed, and forwarded them to the project headquarters. This procedure helped to keep the information confidential.

The cooperation of the participants was gratifying. More than 85 percent of the people who were asked to execute the final time-study instrument did so until completion of the study.

The time-log data were transferred to punch cards by the clerical staff of the research project and then machine tabulated. The research staff made analyses, for the State and the local health departments separately, of the average daily working time, of the proportion of time spent in the several major categories of activity, and of the relative number of individuals participating in these activities by service and by administrative level. In addition, the relationships between type of activity and level of education, public health training, and salary (as revealed in the interviews) were studied.

## Conclusions

After a number of false starts, a method for a time study of public health personnel was developed. Experience with this method in one

State and in several local health departments indicates that the coding concepts involved are, with minor exceptions, sufficiently clear-cut to enable participants to keep accurate daily time logs with a minimum of effort and that, as a consequence, the time study can be easily and successfully administered. It was found, furthermore, that the accumulated time-log data lent themselves to expeditious analysis and yielded knowledge not heretofore available.

The present time study differs from previous similar studies of public health personnel in two important respects. The daily time log is a time scale, or time bar, which simplifies the mechanics of recording. The system of classification employed is built upon broad, functional categories of activity which are not limited to either specific programs or specific services.

It is believed that this time-study method can serve as an important instrument in public health research. When used in conjunction with well-planned interviews, possibly supplemented by spot observations, the time study can produce quantitative information fundamental to progress in public health administration.

## REFERENCES

- (1) Commonwealth Fund: Time spent in public health activities and cost of these services. New York, Commonwealth Fund, 1940. Mimeographed.
- (2) Dean, J. O.: Job analysis of a rural health officer. Brunswick-Greenville health administration studies No. 6. Pub. Health Rep. 50: 1751-1762, December 1935.
- (3) American Public Health Association: Engineering section project studies in sanitation administration. Sanitation practices in local health departments, 1951. New York, The Association, 1952.
- (4) Milne, J. A., Rice, M. E., Hozier, J. B., and Taranto, G. B.: Time study of public health activities in Mississippi. Pub. Health Rep. 68: 378-390, April 1953.
- (5) Ferguson, M., Graning, H. M., and Cheney, B. A.: Activities of health officers in local health departments. Pub. Health Rep. 67: 673-680, July 1952.
- (6) Graning, H. M., Ferguson, M., Cheney, B. A., and Leffingwell, A. M.: Activities of medical administrators in State health departments. Pub. Health Rep. 66: 619-629, May 1951.
- (7) National Organization for Public Health Nursing: Cost study manual and findings. New York, N. Y., The Organization, 1950.
- (8) Time Study and Methods Conference, 7th. Advanced Management 17: 2-6, April 1952.

# Program Distribution of Working Time in Health Departments

By EDWARD M. COHART, M.D., and WILLIAM R. WILLARD, M.D.

EARLY in the Yale Public Health Personnel Research Project, a time study was conducted in the State health department and in eight selected local health departments in Michigan. The study was intended to determine the distribution of time according to (a) programs, (b) professional and administrative activities, and (c) persons with whom activities were carried on. The method used did not fulfill all these objectives, but it was possible to analyze the data for program distribution of time, in a fashion similar to that used by Milne and his co-workers in Mississippi (1). Moreover, the experience in Michigan contributed to the development of another time study method, as reported in a separate article (this issue of *Public Health Reports*, p. 570).

## The Study Method

The time log used for this study was a simple instrument. It consisted of six blank columns: a narrow left-hand column headed "When: Time Started," a broad center column headed

"What, With Whom, and How," and four narrow right-hand columns headed "Travel," "Reports and Records," "Correspondence," and "Telephone." Instruction sheets included several sample time logs and suggestions for keeping the record. Each activity was to be reported by recording its starting time, its general nature in a one- or two-word summary, what was done, its purpose, how it was done, and with whom it was done. Time spent in travel, in reading and writing reports and records, in correspondence, and in telephone conversations for each activity was to be entered in the appropriate right-hand column. Activities were to be recorded to the nearest 5 minutes.

All full-time professional and semiprofessional personnel with the exception of secretarial and clerical workers performing routine tasks only and the staff of the State biological laboratory were eligible to participate in the study. When a number of workers in the same professional category in the same health department were performing essentially the same activities—school nurses with almost identical assignments, for example—only one of these workers was asked to keep a time record. The time allocations of this worker were then multiplied by the number of workers in the group.

Of 185 eligible workers in the State health department, 108 (58 percent) participated either directly or through a representative. This relatively low percentage resulted from the fact that only 29 percent of the laboratory personnel participated, as compared with 80 percent or more of the personnel in the other

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*Dr. Cohart and Dr. Willard were co-directors of the Yale Public Health Personnel Research Project. Dr. Cohart is associate professor of public health at Yale University, and Dr. Willard is now dean of the College of Medicine at Syracuse, State University of New York. The Yale project was supported by research grants from the National Institutes of Health, Public Health Service, and the National Tuberculosis Association.*

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services. With one exception, the laboratory participants were all workers in branch laboratories, the central laboratory having declined to participate in the study.

Of 181 eligible workers in the eight local health departments, 166 (92 percent) participated either directly or through a representative. The percentage of participating personnel in all services except the medical service was high, and even in the medical service 57 percent participated.

Thus, the eight local health departments are adequately represented in the sample, but the State health department sample is definitely biased by the exclusion of a major portion of the laboratory service.

The participants were asked to keep the time log daily for one week during the fall and winter months of 1951-52. It was felt that one week would be sufficient length of time to test the method used, which was the primary purpose of the study in Michigan. Recently, Milne and his associates (1) have reported, on the basis of a time study in Mississippi, that a reasonably accurate estimate of the distribution of time can be obtained from a 1-week sample, provided that an unusual week, such as one during the summer months, is not chosen.

Approximately one-third of the time of both State and local health department personnel could not be identified with a program, a proportion somewhat greater than the 29 percent of "interrelated time" found in the Mississippi study. It is believed that a truly discriminating instrument would yield a smaller residue of time which would defy program identification. The time log used in this study would appear to be less efficient than the daily time sheet with checklist used in the Mississippi study.

The time not identified with any specific program was allocated to specific programs according to the distribution of program-specified time. This was done for each service in the State and local health departments separately. The results are, therefore, comparable with the results that Milne reported for Mississippi on the basis of the distribution of "interrelated time according to the percentage distribution of total identified time." It is recognized that the validity of this procedure for allocating uncategorized time can be questioned, especially when it involves such a sizable proportion of the total time. However, in the absence of more accurate data, this would appear to be the only practical expedient. The results are shown in tables 1 and 2.

Table 1. Percentage of total working time devoted to specified program areas in the Michigan Department of Health <sup>1</sup>

Program areas	Medical service	Nursing service	Sanitation service	Statistics service	Laboratory service	Administration service	Other services	All services
Number in service.....	10	13	27	8	90	16	21	185
Number participating in study.....	8	11	22	8	26	14	19	108
Acute communicable disease.....	2.9	2.3	0	52.7	19.3	1.7	2.8	12.4
Cancer.....	1.0	0	0	3.0	5.5	.1	.1	2.9
Chronic disease.....	17.8	.2	0	0	.2	.2	1.4	1.2
Civil defense.....	2.8	0	0	20.5	0	1.7	1.6	1.4
Crippled children.....	.3	0	0	0	0	0	.3	.1
Dental hygiene.....	20.2	11.6	.1	.8	0	0	25.4	4.8
Environmental sanitation.....	1.0	0	35.1	0	3.1	35.4	2.9	10.1
Heart.....	.3	0	0	0	0	0	.2	.1
Industrial hygiene.....	.2	8.2	63.9	0	19.0	25.1	.3	21.4
Maternal and child health.....	32.0	.1	0	17.7	.9	4.8	48.9	8.9
Mental hygiene.....	.3	6.7	0	0	0	0	.8	.6
School health.....	3.9	6.2	.7	0	0	1.8	11.5	2.2
Tuberculosis.....	17.3	18.5	.2	5.3	17.3	19.6	2.6	12.9
Venereal disease.....	.1	46.2	0	0	34.7	9.6	.2	21.0
Total.....	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

<sup>1</sup> Estimate on basis of the allocation of uncategorized time to program areas according to distribution of program-specified time.

**Table 2. Percentage of total working time devoted to specified program areas in eight local health departments in Michigan <sup>1</sup>**

Program areas	Medical service	Nursing service	Sanitation service	Laboratory service	Administration service	Other services	All services
Number in service.....	14	104	31	7	17	8	181
Number participating in study.....	8	102	29	7	14	6	166
Acute communicable disease.....	15.5	11.8	1.3	12.6	15.9	0.6	10.2
Cancer.....	0	0	0	0	0	.9	0
Chronic disease.....	.4	1.2	0	.1	0	0	.7
Civil defense.....	.7	.5	.3	0	0	0	.4
Crippled children.....	.5	4.9	0	0	1.2	3.2	3.1
Dental hygiene.....	1.6	1.5	0	0	.2	20.2	1.9
Environmental sanitation.....	5.0	0	91.9	48.9	33.5	29.4	22.5
Heart.....	0	.3	0	0	0	0	.2
Industrial hygiene.....	0	0	0	.1	.4	0	.1
Maternal and child health.....	37.4	19.0	0	1.8	19.0	3.5	15.8
Mental hygiene.....	1.8	2.3	0	.1	0	26.6	2.6
School health.....	12.8	42.6	6.5	0	1.8	15.5	27.4
Tuberculosis.....	21.0	15.3	0	10.2	22.3	0	12.9
Venereal disease.....	3.3	.6	0	26.2	5.8	.2	2.2
Total.....	100.0	100.0	100.0	100.0	100.0	100.0	100.0

<sup>1</sup> Estimate on basis of the allocation of uncategorized time to program areas according to distribution of program-specified time.

### Allocation of Time to Programs

In the State health department, 21 percent of the time is devoted to industrial hygiene, and a similar proportion of the time to venereal disease control. Ten to fifteen percent is spent in each of the following programs: environmental sanitation, acute communicable disease control, tuberculosis control, and maternal and child health, including school health. Dental hygiene and the chronic diseases, including cancer and heart disease, each accounts for 5 percent of the time. One percent of the time is devoted to mental hygiene, and 1 percent to civil defense.

In the local health departments, the greatest emphasis is on health programs for children. Thus, 27 percent of the time is devoted to school health; 16 percent to maternal and child health; and 3 percent to crippled children. Furthermore, it can be assumed that children are the major recipients of services in the programs for acute communicable disease control and for dental and mental hygiene. Ten percent of the time of personnel in local health departments is devoted to the former, and 2 percent to each of the latter programs. Environmental sanitation absorbs 22 percent of

the time. There is practically no industrial hygiene activity on the local level. About 13 percent of the time is devoted to tuberculosis control, and 2 percent to venereal disease control. Chronic diseases, including heart disease and cancer, account for 1 percent of the time.

### Discussion

The authors do not possess the intimate knowledge of the situation in Michigan that would be necessary to evaluate the distribution of time shown by this study. Nevertheless, there appear to be a number of findings that call for investigation. It would seem, for example, that insufficient attention is being given to mental health and to the noninfectious diseases and disabilities of adult life.

The emphasis placed on any health department program is determined by such factors as the nature and magnitude of the problem, the knowledge and ability to do something about it, the need for organized social action for control, the interests and desires of individuals in authority and pressure groups, the availability of funds, and the dictates of tradition. It can be accepted as axiomatic that

services. With one exception, the laboratory participants were all workers in branch laboratories, the central laboratory having declined to participate in the study.

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Number participating in study.....	8	11	22	8	26	14	19	108
Acute communicable disease.....	2.9	2.3	0	52.7	19.3	1.7	2.8	12.4
Cancer.....	1.0	0	0	3.0	5.5	.1	.1	2.9
Chronic disease.....	17.8	.2	0	0	.2	.2	1.4	1.2
Civil defense.....	2.8	0	0	20.5	0	1.7	1.6	1.4
Crippled children.....	.3	0	0	0	0	0	.3	.1
Dental hygiene.....	20.2	11.6	.1	.8	0	0	25.4	4.8
Environmental sanitation.....	1.0	0	35.1	0	3.1	35.4	2.9	10.1
Heart.....	.3	0	0	0	0	0	.2	.1
Industrial hygiene.....	.2	8.2	63.9	0	19.0	25.1	.3	21.4
Maternal and child health.....	32.0	.1	0	17.7	.9	4.8	48.9	8.9
Mental hygiene.....	.3	6.7	0	0	0	0	.8	.6
School health.....	3.9	6.2	.7	0	0	1.8	11.5	2.2
Tuberculosis.....	17.3	18.5	.2	5.3	17.3	19.6	2.6	12.9
Venereal disease.....	.1	46.2	0	0	34.7	9.6	.2	21.0
Total.....	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

<sup>1</sup> Estimate on basis of the allocation of uncategorized time to program areas according to distribution of program-specified time.

# European Approaches to Aging

By WILMA DONAHUE, Ph.D., and CLARK TIBBITTS

AMERICAN PARTICIPANTS in the Third International Gerontological Congress in London who took advantage of the opportunity to observe programs for older people in the United Kingdom and in nearby countries came home inspired by the extent and variety of activity they found (1).

The appearance of large proportions of older people in the populations of European countries occurred about a generation earlier than in the United States. Hence, it is natural that these countries should have done a good deal of pioneering in meeting their needs. This brief report presents the highlights of activity in the countries with the most advanced approaches.

## Financing the Later Years

Most European countries have federally operated contributory, work-connected pension

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systems similar to our Old-Age and Survivors Insurance, with supplementation through assistance grants. Eligibility is usually based on retirement from gainful employment or survivorship. Pensionable age for men varies from 65 years in Denmark, England, and Switzerland to 67 in Sweden and 70 in Norway.

Cash benefits are normally insufficient to meet all requirements, particularly those of persons with problems of infirmity, illness, living arrangements, or social isolation. Recognizing this circumstance, most countries offer many services and facilities on a community support basis, subsidized by either public or voluntary funds.

## Medical Care

All European countries have infirm, long-term ill, and invalided older people who present an increasing demand for health services and custodial care. The United Kingdom, Norway, and Sweden are undertaking to meet medical needs through universal coverage schemes which guarantee the availability of the best the countries can afford. Denmark and Switzerland have health insurance schemes, compulsory for individuals in certain income brackets and administered by local societies, usually under the supervision of state authorities.

Most of the hospitals are community operated and many include special geriatric units. Frequently, especially in the Scandinavian countries, the chronic hospital or geriatric unit is a part of a total housing plan for old people. A special geriatric ward is to be found in Stockholm's Municipal Hospital.

Hospitals for the mentally ill are mainly

state-operated but are crowded and generally considered understaffed and inadequate in number. Some efforts are being made to make more effective use of present space since there is little construction in this field. In England patients who have become old in mental hospitals, but who no longer need special psychiatric care, are being released to live in special homes for the confused senile. Results thus far indicate that many such old people improve in the homelike, nonrestrictive atmosphere. In Amsterdam, plans are under way for a "transition hospital" for confused patients where treatment for physical and mental disorders will be carried out with the expectation that a significant proportion of the patients will be able to return to their homes instead of being committed. Cities in most countries have begun to establish outpatient health department services for the mentally ill.

Perhaps the most striking feature of medical programs is the emphasis placed on rehabilitation. Most hospitals have extensive facilities for thermal and mechanical therapy. Dictated in part by construction and operating costs, the underlying objective is to enable older people to remain functional and at least partially self-sufficient in their own homes. Accordingly, in addition to the hospital services, such aids as spectacles, hearing aids, dentures, occupational therapy, and chiropody are widely available in Great Britain, Scandinavia, and, to some extent, in Holland and Switzerland.

### Home Services

Remaining in one's own home becomes possible for many old people because suitable housing and community services are becoming available. The principle of home living is rooted in several factors: the conviction that most want the dignity and the security it affords; the knowledge that people generally recover more rapidly at home; the costliness of hospital and domiciliary facilities.

Many infirm elderly people are enabled to remain at home, alone or with children, through the close integration of hospital and home medical services, visiting nurse, housekeeping help, night attendants, laundry and bath services, friendly visitors, community kitchens to which

older people may go for meals and from which meals are taken to elderly shut-ins. Even in France, where relatively little has been done for older people, these special home helps are available for a limited number of older people through money raised by the National Old People's Day. In Scandinavia, where home helps are being developed on both a paid and a voluntary basis, many people of the middle class are volunteering to go into the homes of older people needing domestic or other services and are ready to accept training for that work.

Community clubs for older people are becoming popular in England, Holland, and Switzerland but not in the Scandinavian countries, Germany, Italy, and France. In some communities vacations are provided, thus taking the old person out of his children's home for a few weeks a year.

Day hospital programs where old people receive treatment and take part in occupational therapy are common in the geriatric hospitals of England. Hostels and halfway houses relieve hospitals of patients who are mending but not yet ready to go home.

Many of these services are coordinated by the district medical officer of health. In the borough of Finsbury, London, the health officer has added an SOS card system. Older people living alone summon help by placing the card in the window. Neighbors notify the health department when such a card appears.

### Housing and Living Arrangements

Both independent and group housing for pensioners have been developed in Europe in great variety. The Swedish Government makes it incumbent upon every community to provide housing for its elderly people. Government subsidies are generally available in most countries though, in some cases, communities have built such dwellings on their own initiative.

In all these countries there has been a good deal of experimentation ranging from single detached dwellings to large organized villages containing acute and chronic hospitals, communal dwellings for the frail, and individual modern apartments for the able-bodied. From many experiments a number of useful principles have emerged.



One of these is that the greatest possible degree of privacy should be afforded, preferably in one's own flat or apartment, or, at least, in a private room in a boarding or old age home. Some that have provided dormitory living are now being remodeled to afford individual rooms and apartments.

The second principle is that housing must be located in the city in proximity to friends and institutions and not in remote, rural locations. Most of the countries of northwest Europe are building housing to replace that knocked out during the war. Scattered through these developments, in single units or in blocks, are a good many flats, modern apartment buildings, and row houses built especially for older people.

The third principle, now taking hold, is that housing and medical facilities should be separated. Incorporation of a hospital into a housing development suggests illness, it is believed, and tends to make for expensive multiplication of facilities. Accordingly, new housing facilities are being built as housing, and attention is given to facilitating transfer to medical and custodial institutions if the need arises.

Institutional homes for the aged date back many years in Europe. Many of them are still in use and are heavily endowed by voluntary societies. While the newer homes are generally public facilities, there are still many being built by religious organizations and labor groups, especially in Holland and Germany.

One aspect of housing that strikes the observer is that adult children are expected to provide homes for their aged parents if at all possible. In Great Britain, almoners attached to hospitals and welfare agencies make great effort to achieve this arrangement. In Germany, Switzerland, Italy, and France it is a matter of expectation that the family will care for its older members. There is less emphasis in the Scandinavian countries upon keeping the old person at home, and attempts are made to place the older person under circumstances best for all ages concerned. In Denmark, adult children are legally liable for the support of their parents. Until recently, the pension program accommodated such economic pressure, but present difficulties have increased the need of the aged to depend on their children, with resulting friction and resentment on the part of

both generations. But in all countries, the home helps mentioned earlier have been developed, in part, to ease the burden on families trying to accommodate aged parents.

### Activity Programs

The prevailing attitude in most European countries has been that older persons are worn out and eager to rest. Relatively little effort has been made to find new roles for retired people or opportunity for creative or recreational pursuits in housing projects or in old age homes.

Yet, there are some outstanding exceptions. One is the Finsbury employment scheme for the elderly, sponsored by the health department, in which older men and women of the community work 2 hours a day testing fountain pens, assembling electric switches, packaging bandages, and on other light work. Beyond the experimental stage, the workshop is now housed in its own modern building where it affords social contacts and income supplement to its workers.

### Employment

Primarily to hold down pension costs but also to overcome worker shortages in some occupations, attention is being given to continued employment of older people. Pension systems contain financial incentives to remain at work. In Great Britain, a national commission is trying to correct the factors which make for inadequate utilization of older people's services. Employers are being urged to examine their practices to see whether more older workers can be engaged and retained.

Scandinavian countries have developed practically no recreational activities for older people. Currently, these countries are giving attention to the question of whether gainful employment should be further extended beyond age 65 and to the question of training for crafts in which there is already a rich background.

### Organization

Public agencies and funds are involved in programs for older people to a much greater extent than in the United States. The princi-



state-operated but are crowded and generally considered understaffed and inadequate in number. Some efforts are being made to make more effective use of present space since there is little construction in this field. In England patients who have become old in mental hospitals, but who no longer need special psychiatric care, are being released to live in special homes for the confused senile. Results thus far indicate that many such old people improve in the homelike, nonrestrictive atmosphere. In Amsterdam, plans are under way for a "transition hospital" for confused patients where treatment for physical and mental disorders will be carried out with the expectation that a significant proportion of the patients will be able to return to their homes instead of being committed. Cities in most countries have begun to establish outpatient health department services for the mentally ill.

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*The habits and interrelationships of rodent species in the Hamakua District of Hawaii are found to be favorable to the perpetuation of enzootic plague.*

# Observations on Rats in an Enzootic Plague Region of Hawaii

LEO KARTMAN, Sc.D., and RICHARD P. LONERGAN, M.P.H.

THE INTERRELATIONS of different rodent species, their survival, movements, feeding habits and, in general, their ability to coexist are fundamental conditions for the maintenance and spread of wild rodent plague. Expert opinion considers that infection per saltum is operative under unusual circumstances, whereas the spread of the disease is primarily by contiguity, probably by "an accumulation of small movements among rodents" (1) and by normal dispersal (2-4). In a discussion of this problem, Davis (5) distinguished between intracolony and intercolony spread of plague among South African rodents and concluded that spread by the former method was more usual.

The extent of movement and the home range of small mammals generally has been found to be quite restricted (6-9) and the movement rate

of *Rattus norvegicus* is known to be very low in constant environments (10). Similarly, a study of rats in Hawaii indicated both limited movements and a restricted home range on the island of Oahu (11).

A project on methods for the control of fleas on wild rodents inhabiting an enzootic plague region on the island of Hawaii provided observations pertinent to a discussion of the relation of rat characteristics to the perpetuation of wild rodent plague.

## Study Areas and Methods

A detailed description of the study areas and materials and methods employed already has been presented (12). The work, which was concerned primarily with wild rodent flea control, was conducted from February 1952 to May 1953 in a field of sugarcane and in a gulch near the town of Honokaa, Hamakua District, Hawaii. Plague is both enzootic and endemic in this region.

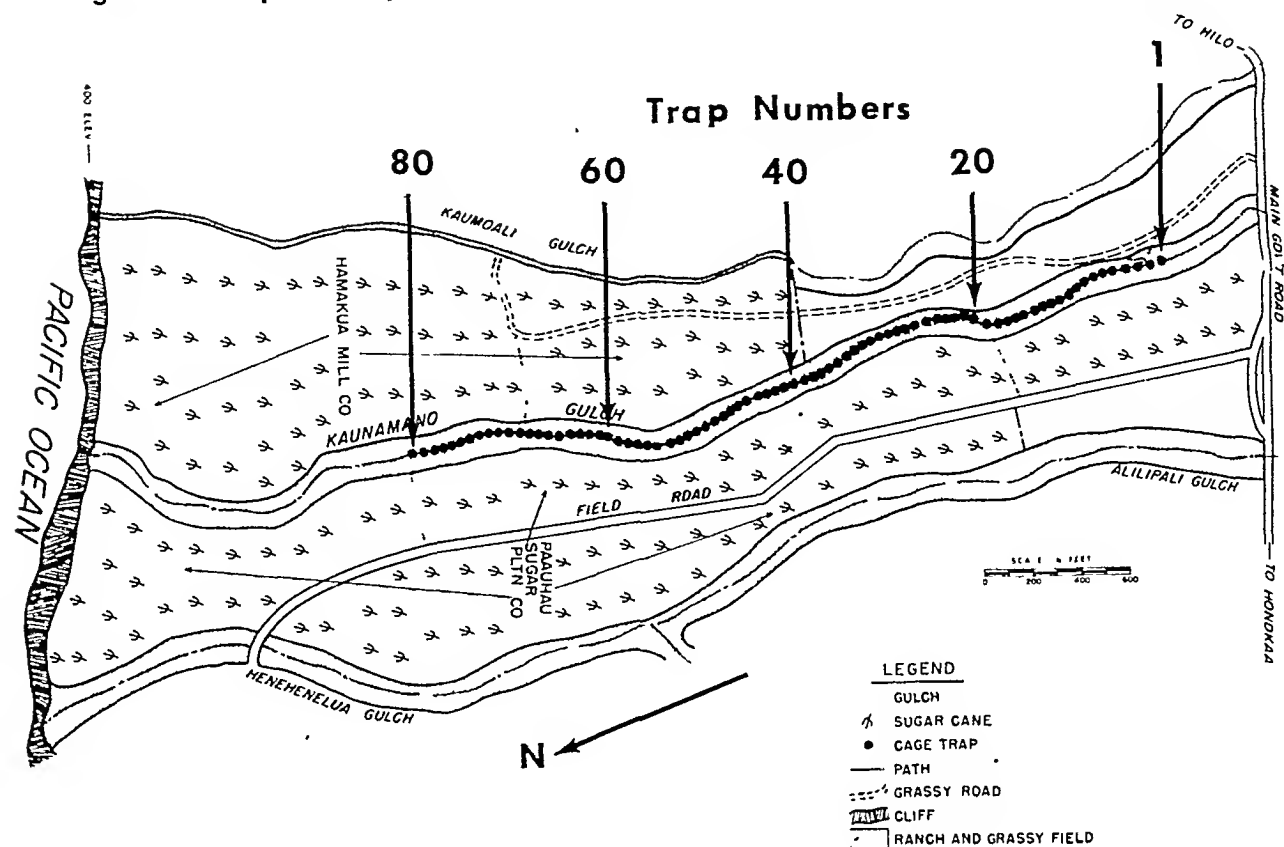
Most of the work was done in Kaunamano gulch, one of numerous ravines bordered by sugarcane fields, grassy slopes, and small cultivated areas. Eighty trapping stations were established within an area of about 4,000 feet in the gulch, where the elevation ran from 400

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*Dr. Kartman, now medical entomologist with the San Francisco Field Station of the Communicable Disease Center, Public Health Service, was chief of the CDC Hawaiian Field Station during 1951-53. Mr. Lonergan also participated in the study and is now sanitary engineer at the Technical Development Laboratories of the center at Savannah, Ga.*

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Figure 1. Map of study area in Kaunamano gulch, showing the location of trap sites.



to 750 feet (fig. 1). Each station was supplied with cage traps at 50-foot intervals. The traps were similar to the kind shown in the report by Spencer and Davis (11).

At one time during the work, bait boxes were placed at intervals of 5 stations beginning with station No. 1. Rodent activity at these bait boxes was estimated on the basis of bait con-

sumption (12) and numbers of fecal pellets. The fecal pellets were counted and the boxes were thoroughly cleaned at each visit.

A small part of the work, lasting about 1½ months, was conducted in a field of sugarcane (field No. 1). This consisted of about 103 acres of mature cane at an elevation of from 200 to 900 feet. An area of approximately 40 to

Table 1. The number of new rats live-trapped by months, in Kaunamano gulch <sup>1</sup>

Species	1952											
	July			August			September			December		
	Num-ber	Per-cent	Rats per 9 trap-days	Num-ber	Per-cent	Rats per 8 trap-days	Num-ber	Per-cent	Rats per 8 trap-days	Num-ber	Per-cent	Rats per 10 trap-days
<i>Rattus hawaiiensis</i> .....	33	46.4	3.5	22	56.4	2.6	21	56.7	2.6	40	54.0	4.0
<i>Rattus rattus</i> group <sup>2</sup> .....	36	50.8	4.0	14	36.0	1.7	13	35.2	1.6	23	31.2	2.3
<i>Rattus norvegicus</i> .....	2	2.8	.2	3	7.6	.3	3	8.1	.3	11	14.8	1.1
Total rats and ratio per trap-days.....	71	100	7.9	39	100	4.8	37	100	4.6	74	100	7.4

50 acres around the periphery of the field was supplied with 200 cage traps at 35-foot intervals.

The traps were baited either with small coconut squares or small pellets made of commercial dog food mixed with rolled oats and wrapped in waxed paper. Rolled barley or rolled oats was used in the bait boxes in amounts that could not be completely consumed between visits.

In a few cases, traps were modified so that an attached clock would be stopped at the moment the trap trigger was released. By setting the alarm in the morning for 8 p. m., the time of capture could be determined by whether or not the alarm spring had unwound.

Captured rats were anesthetized with ether (rarely with chloroform), marked by toe amputation, combed for ectoparasites, checked for pertinent physical data, and released at the point of capture. The results of blood examinations and body temperature determinations have been published elsewhere (13, 14). Individual record cards were kept for each animal captured.

During the course of the major portion of the study, the rats were subjected to the effects of 10 percent DDT powder in pyrophyllite. During October and November 1952 the main effect of warfarin-poisoned oats was studied. The DDT appeared not to have a noticeable influence upon the rats. The warfarin decimated the commensal rat population, and data during this period have been eliminated for purposes

of the present report, unless otherwise indicated.

The pressure of other work prevented the use of a grid system of trapping and a more extensive study of the rodents in the plague region. Nevertheless, although the methods employed do not give the detailed results desirable in an investigation of rodent ecology, the data represent a definite contribution to the knowledge of rodent behavior in this region inasmuch as little or nothing has been published in this regard.

## Results and Discussion

The four species of rodents found in the Hamakua District are: *Rattus rattus* subspecies *R. r. rattus* and *R. r. alexandrinus*; *Rattus norvegicus*; *Rattus hawaiiensis*, and *Mus musculus*. For present purposes, all subspecies of *R. rattus* are considered together and no data are presented on the house mouse. All of these species live wild in the field, but the native rat, *R. hawaiiensis*, is the only truly wild rodent in Hawaii—it lives only in the field and never in human habitation.

The number of rats of each species trapped during each month in Kaunamano gulch is shown in table 1. The predominance of *R. hawaiiensis* and *R. rattus* in this region corroborates a former study (15). The average number of rats of all species per acre in gulch areas of the Hamakua District has been estimated at

Table 1. The number of new rats live-trapped by months, in Kaunamano gulch <sup>1</sup>—Continued

Species	1953											
	January			February			March			April		
	Number	Percent	Rats per 5 trap-days	Number	Percent	Rats per 7 trap-days	Number	Percent	Rats per 13 trap-days	Number	Percent	Rats per 14 trap-days
<i>Rattus hawaiiensis</i> -----	40	76.9	8.0	38	66.6	5.4	109	48.6	8.3	132	55.9	9.4
<i>Rattus rattus</i> group <sup>2</sup> -----	11	21.2	2.2	7	12.2	1.0	96	43.0	7.3	65	27.6	4.6
<i>Rattus norvegicus</i> -----	1	1.9	.2	12	21.2	1.7	19	8.4	1.4	39	16.5	2.7
Total rats and ratio per trap-days-----	52	100	10.4	57	100	8.1	224	100	17.2	236	100	16.8

<sup>1</sup> Excludes data for October 1953, when the effects of warfarin poisoning on the *rattus* group population were obvious: *R. hawaiiensis*, 21; *R. rattus* group, 4; *R. norvegicus*, 3.

<sup>2</sup> *Rattus rattus rattus* and *Rattus rattus alexandrinus*.

between 40-60 (15). Application of the Lincoln index (16)

$$\frac{\text{animals marked in precensus period}}{\text{other animals present in precensus period}} = \frac{\text{marked animals trapped in census period}}{\text{other animals trapped in census period}}$$

to some of the data recorded here showed, for example, that the estimated total populations of all rat species in the gulch study area during the periods July-August 1952 and January-February 1953 were respectively, 182 and 223. The actual number of captures of all rat species made during these periods was respectively, 110 and 109.

In another report (12), the commensal rat species, primarily *R. rattus*, were shown to be the predominant populations feeding at the bait boxes. The report also showed that bait consumption could be maintained at an almost constant level in the manner shown by Chitty

for *R. norvegicus* (17). The counting of fecal pellets may also provide a means of determining the population level (fig. 2). The generally greater abundance of small fecal pellets suggests that young individuals predominated among rats feeding in the bait boxes.

Rolled barley was used from the first baiting on May 21 to July 2. During this time the fecal pellet curve rose to a maximum and leveled off. However, on July 3 the bait was changed to rolled oats. This introduced two new factors—a change in the appearance and odor of the food, and a more highly processed food not requiring the time-consuming task of removing the hulls. Thus, many rats may have been shy of the new food for varying periods, and those that fed did not linger in the bait boxes as long as they had when the rolled barley was used. The result was a sharp drop in the fecal pellet curve which began to rise again as more rats adjusted to the new situation.

Figure 2. The number of fecal pellets removed from bait boxes at each visit and the effect of warfarin poisoning on this measure of rat activity.

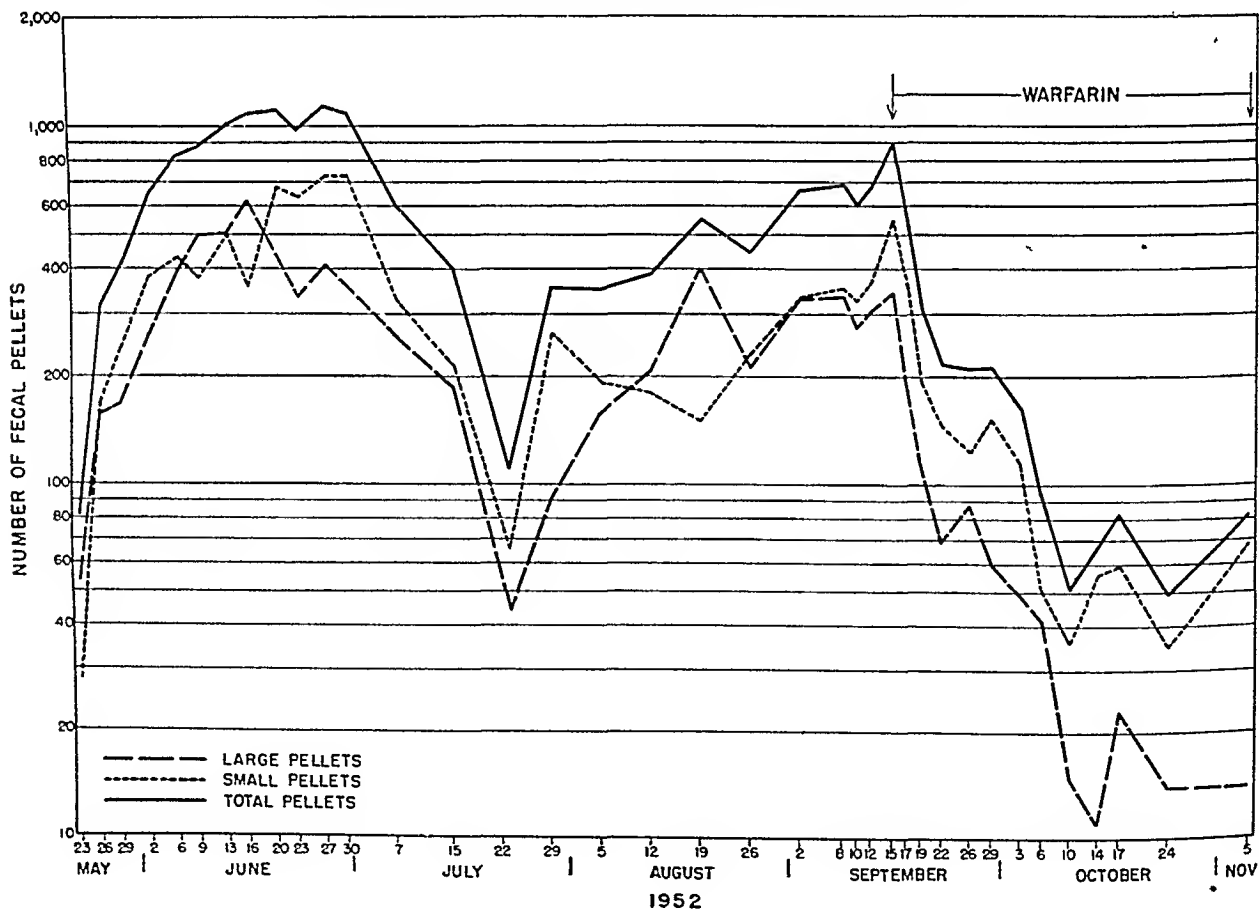


Table 2. Proportion of sexes of live-trapped *Rattus* species

Location	<i>R. hawaiiensis</i>			<i>R. rattus</i> group <sup>1</sup>			<i>R. norvegicus</i>		
	Male	Female	Ratio	Male	Female	Ratio	Male	Female	Ratio
Field No. 1.....	25	28	0.9	25	32	0.8	10	4	2.5
Kaunamano gulch.....	234	222	1.1	136	133	1.0	36	57	.6
Total.....	259	250	1.0	161	165	.9	46	61	.8

<sup>1</sup> *Rattus rattus rattus* and *Rattus rattus alexandrinus*.

On August 11, a harvest of sugarcane in a field adjacent to the study area was initiated and lasted until August 22. This forced new rats into the gulch area, as was indicated by the trapping, and may be partially responsible for the rising curve of fecal pellets.

Finally, the introduction of warfarin-poisoned rolled oats on September 15 produced the second sharp depression in the curve. These considerations suggest that a controlled count of fecal pellets is a fairly sensitive index of a rat population level as it is influenced by various environmental factors.

No significant differences were found in the proportion of the sexes of the three rat species in either of the study areas (table 2). However, the paucity of *R. norvegicus* did not allow a valid comparison for this species.

Some idea of the survival of the rats can be obtained by an analysis of recaptures, or what amounts to the disappearance of retrappable rats over a period of time (18). These data indicate a high probability of disappearance for all three species (table 3). This corroborates findings on the island of Oahu (11). The reasons for the high disappearance rate are obscure and appear to contradict the fairly constant level of bait consumption (12) and rodent activity (fig. 2). Since an equal number of rats disappeared after their initial capture as were recaptured, some difficulty in retrapping appears to have influenced the results. Among the known factors, the inefficiency of individual traps and frequent springing of traps by mice, *M. musculus*, are probably of importance.

In field No. 1, where trapping lasted less than 2 months, almost 50 percent of the traps failed to capture a single rat, whereas captures of rats in Kaunamano gulch were more consistent (fig.

3). Although the establishment of trap-frequenting orientations by rats over a period of time is undoubtedly a factor in trapping success, the ecological difference between the gulch and field also may have been a factor since 100 percent of the stations became active in the gulch area in less than 2 months (12). However, a good deal of variation in success of trapping small mammals has been found to be correlated more with bait attractiveness than with population level (19). Thus, the above factors must be considered in an evaluation of rodent survival and other ecological factors.

The coexistence of several rodent species within the same environmental sector is undoubtedly of prime importance for the maintenance of wild rodent plague (20), and this idea is implicit in the observations of Eskey (21) in his classic study of plague epidemiology in Hawaii. Data published elsewhere have shown that all three rat species in Hawaii may be in-

Table 3. "Survival" of *Rattus* species in Kaunamano gulch <sup>1</sup>

Month	<i>R. hawaiiensis</i>	<i>R. rattus</i> group	<i>R. norvegicus</i>	Total
Number recaptured.....	107	58	11	176
1st.....	77	36	7	120
2d.....	16	10	1	27
3d.....	10	8	1	19
4th.....	2	3	1	6
5th.....				
6th.....	1	1	1	3
7th.....				
8th.....				
9th.....	1			1
Not recaptured.....	103	46	23	172

<sup>1</sup> Data exclude rats found dead, rats first captured during the last 2 months of trapping, and non-hawaiensis taken during the poisoning period.

duced to feed in the same bait box and are hosts to the same species of plague vector fleas and trypanosomes (12, 13). These findings are supported by data on the number of times all species of rats were captured in the same trap (fig. 4).

The number of each rat species attracted to any particular trap generally corresponded to the percentage species composition of the different rat populations in the area (table 1). Although thought to be extremely shy (22, 23), the Hawaiian rat predominated in the majority of trap captures. The probability that the time of feeding does not intervene as a limiting factor in this connection is suggested by a few data on the exact time rats were captured. The available records follow:

<i>R. hawaiiensis</i>		<i>R. rattus</i> group		<i>R. norvegicus</i>	
a. m.	p. m.	a. m.	p. m.	a. m.	p. m.
3:30	1:00	3:30	7:45	3:55	
5:17	3:20	4:53	11:30	5:40	
7:10	8:00	5:10	11:40		
	9:50	9:00			
	9:55				

There are enough overlapping times to suggest that many rats of each species undoubtedly seek food in the same area at approximately similar times. Whether or not there is any

serious interspecific competition, more aggressive species are present. The weaker are factors which have not been determined. All three species of rats were in very close proximity on the islands, and the possibility of predation on *R. hawaiiensis* was suggested.

The Hawaiian rat is thought to be a primary wild plague reservoir, and other species periodically become infected (24). The possible role of the *R. rattus* group, is not known, but this species was frequently taken in the traps and captured in the population in the study area. In the areas studied, there existed a community population composed of the species mentioned.

Other evidence of the stability of the nature of the rodent population was obtained by a study of recapture movements of the rats. A summary of the results is presented in table 4. The individual rat movements are not shown. The restricted amount of movement of all three species of rats is not surprising, much as these animals would be

Figure 3. Trapping efficiency as shown by frequency of live captures of rats by traps No. 1, and B—Kaunamano gulch.

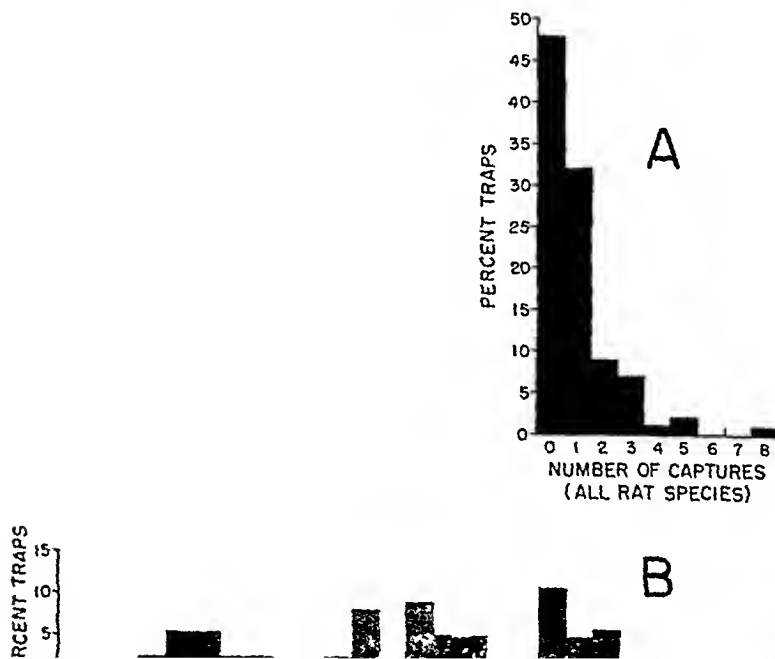
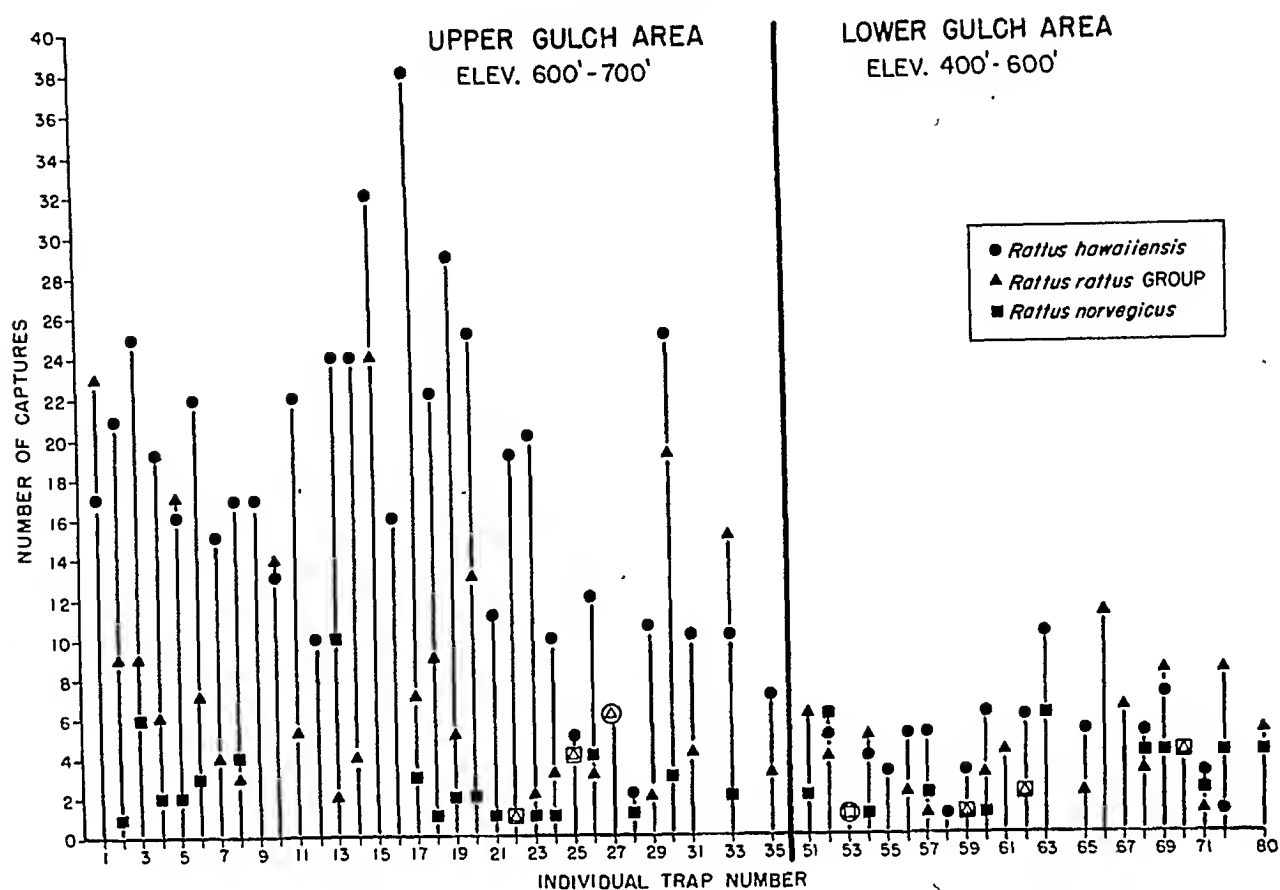


Figure 4. The number of times three species of *Rattus* were captured alive in the same trap in Kaunamano gulch.



a small area until profound environmental change occurred. Thus, the following percentages of captures were made between 0 and 100 feet from the location of the original capture:

	Field No. 1	Kauna- mano gulch
<i>Rattus hawaiiensis</i> -----	74.1	94.6
<i>Rattus rattus</i> group-----	78.2	80.5
<i>Rattus norvegicus</i> -----	28.5	71.4
All spp. (both locations)--		86.7

This indicates predominantly exploratory rather than migratory movement. Few extreme movements were recorded. Two exceptions were: rat No. 130, a female *R. r. alexandrinus*, which was recaptured after 5 months 3,450 feet from the place of original capture, and rat No. 155, a male *R. norvegicus*, recaptured after 6 months 1,500 feet from the site of original capture.

It cannot be asserted that these movement data shed light upon the home ranges of the

various rat species since home range is a measure of area. In line with the contentions of Holdenried (25), many of the rat movements recorded here are probably measurements of maximal movement which is thought to represent the longest axis of a home range. It must be borne in mind that these so-called maximal movements are determined within the limits set by the arbitrary spacing of traps. In many cases they are probably only fair approximations of the true maximums.

The observations recorded here suggest that, in the region studied, the three species of rats do not carry out extensive migrations, are more or less sedentary populations, and appear to coexist in an environment which favors their close physical proximity with a minimum of adverse interspecific-coaction. These characteristics, together with observations already recorded regarding their ectoparasites and disease relationships (12, 13, 21, 24), appear to favor the perpetuation of wild rodent plague.



Table 4. Summary data of *Rattus* spp. recaptures and movements <sup>1</sup>

Type of data	<i>R. hawaiiensis</i>		<i>R. rattus</i> group <sup>2</sup>		<i>R. norvegicus</i>		Totals
	Field No. 1	Kauna- mano gulch	Field No. 1	Kauna- mano gulch	Field No. 1	Kauna- mano gulch	
Rats released..... Not recaptured..... Recaptured..... In more than 1 month..... Dead in traps.....	Recapture status						
	53	215	57	107	14	34	480
	35	111	41	48	11	24	270
	18	104	16	59	3	10	210
	4	67	6	36	1	6	110
	3	5	2	-----	2	1	13
	Times recaptured						
Distance (feet) from original capture:							
0.....	5	120	8	34	-----	4	171
1-49.....	10	63	6	17	1	3	100
50-99.....	5	11	4	7	1	3	31
100-149.....	4	2	2	2	-----	-----	10
150-199.....	1	-----	1	4	-----	2	8
200-249.....	-----	1	1	2	1	1	6
250-299.....	-----	1	-----	2	1	-----	4
300-349.....	2	2	1	1	-----	-----	6
350-399.....	-----	2	-----	-----	-----	-----	2
400-449.....	-----	3	-----	1	1	1	6
450-499.....	-----	-----	-----	1	1	-----	2
650-699.....	-----	-----	-----	1	1	-----	2
Total.....	27	205	23	72	7	14	348

<sup>1</sup> These data include only a portion of the total rats captured (see table 1).<sup>2</sup> *Rattus rattus rattus* and *Rattus rattus alexandrinus*.

Table 5. Examples of individual rat movements in Kaunamano gulch

Species and rat No.	Age	Sex	Location <sup>1</sup> of capture (station No.)									
			1952						1953			
			July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.
<i>R. hawaiiensis</i> :												
42.....	Juvenile.....	F	23	22	-----	22	-----	-----	-----	-----	-----	-----
1.....	Adult.....	F	3	3	-----	3	-----	-----	-----	-----	-----	-----
70.....	Juvenile.....	F	2	-----	-----	-----	-----	-----	-----	-----	1	2
152.....	Adult.....	M	-----	-----	-----	20	-----	-----	-----	-----	18	18
72.....	Adult.....	M	-----	-----	-----	-----	-----	19	19	19	20	20
71.....	Adult.....	F	-----	-----	-----	-----	-----	15	15	17	16	-----
<i>R. rattus</i> group:												
25.....	Adult.....	F	29	30	30	-----	-----	-----	-----	-----	-----	-----
44.....	Adult.....	M	15	18	18	-----	-----	-----	-----	-----	-----	-----
16.....	Adult.....	M	-----	-----	-----	-----	-----	18	17	-----	-----	17
50.....	Adult.....	F	-----	-----	-----	-----	-----	14	15	-----	-----	15
130.....	Adult.....	F	-----	-----	80	-----	-----	-----	-----	-----	11	-----
<i>R. norvegicus</i> :												
10.....	Juvenile.....	F	-----	-----	-----	-----	-----	13	-----	13	-----	-----
17.....	Juvenile.....	F	-----	-----	-----	-----	-----	13	-----	-----	-----	17
155.....	Adult.....	M	-----	-----	-----	6	-----	-----	-----	-----	-----	35

<sup>1</sup> See figure 1 for location of station numbers.

## Summary

Observations are reported concerning wild rodents inhabiting areas within an enzootic plague region on the island of Hawaii. The rat species *Rattus hawaiiensis*, *Rattus rattus* subspecies, and *Rattus norvegicus* were captured alive, marked, released, and recaptured to gain some idea of their survival, movements, and interrelations. Results suggested that none of the rat species migrates extensively, that they constitute more or less sedentary populations, and that they appear to coexist in an environment which favors their close physical proximity. Thus, in the areas studied, there appears to be a continuous rodent population having characteristics favorable for the perpetuation of wild rodent plague.

## REFERENCES

- (1) Meyer, K. F.: The known and the unknown in plague. *Am. J. Trop. Med.* 22: 9-36 (1942).
- (2) Pollitzer, R.: Plague. World Health Organization Monographic Series No. 22. Geneva, World Health Organization, 1954.
- (3) Meyer, K. F.: Sylvatic plague. In American Public Health Association Year Book, 1940-41. *Am. J. Pub. Health* 31: 145-148, supplement, March 1941.
- (4) Evans, F. C., and Holdenried, R.: Field study of ground squirrel (*Citellus beecheyi*) in relation to sylvatic plague. *Proc. Soc. Exper. Biol. & Med.* 47: 63-64 (1941).
- (5) Davis, D. H. S.: Ecological studies of rodents in relation to plague control. In *Proc. of the Fourth Internat. Cong. on Trop. Med. & Malaria*. Washington, D. C., 1948. Vol. I, pp. 250-254.
- (6) Evans, F. C.: Studies of a small mammal population in Bagley Wood, Berkshire. *J. Animal Ecol.* 11: 182-197 (1942).
- (7) Storer, T. I., Evans, F. C., and Palmer, F. G.: Some rodent populations in the Sierra Nevada of California. *Ecol. Monogr.* 14: 165-192 (1944).
- (8) Baker, R. H.: A study of rodent populations on Guam, Mariana Islands. *Ecol. Monogr.* 16: 393-408 (1946).
- (9) Davis, D. E.: The home range of some Brazilian mammals. *J. Mammal.* 26: 119-127 (1945).
- (10) Davis, D. E.: The characteristics of rat populations. *Quart. Rev. Biol.* 28: 373-401 (1953).
- (11) Spencer, H. J., and Davis, D. E.: Movements and survival of rats in Hawaii. *J. Mammal.* 31: 154-157 (1950).
- (12) Kartman, L., and Lonergan, R. P.: A preliminary investigation to develop methods of wild rodent flea control in rural areas of an enzootic plague region in the Hawaiian Islands. *Bull. World Health Org.* 1955. In press.
- (13) Kartman, L.: Observations on *Trypanosoma lewisi* and *Grahamella* sp. in the blood of rats from the Hamakua District, Island of Hawaii. *J. Parasitol.* 40: 571-579 (1954).
- (14) Kartman, L.: The body temperature of wild *Rattus* spp. on the island of Hawaii. *Pacific Sc.* 1955. In press.
- (15) Spencer, H. J.: Rodent control. In Report, Hawaii Agricultural Experiment Station, 1937. Honolulu, 1938, pp. 96-110.
- (16) Green, R. G. and Evans, C. A.: Studies on a population cycle of snowshoe hares on the Lake Alexander area. I. Gross annual censuses, 1932-39. *J. Wildlife Manag.* 4: 220-240 (1940).
- (17) Chitty, D.: A relative census method for brown rats (*Rattus norvegicus*). *Nature* 150: 59-60 (1942).
- (18) Davis, D. E.: The survival of wild brown rats on a Maryland farm. *Ecol.* 29: 437-448 (1948).
- (19) Fitch, H. S.: Seasonal acceptance of bait by small animals. *J. Mammal.* 35: 39-47 (1954).
- (20) Davis, D. H. S.: Plague in Africa from 1935 to 1949, a survey of wild rodents in African territories. *Bull. World Health Organization* 9: 665-700 (1953).
- (21) Eskey, C. R.: Epidemiological study of plague in the Hawaiian Islands. *Pub. Health Bull. No. 213*. Washington, D. C., U. S. Government Printing Office, 1934.
- (22) Stokes, J. F. G.: Notes on the Hawaiian rat. *Occasional Papers, B. P. Bishop Museum, Honolulu.* 3: 261-271 (1917).
- (23) Svihla, A.: The Hawaiian rat. *Murrelet* 17: 3-14 (1936).
- (24) Dopmeyer, A. L.: Plague eradication measures on the island of Maui, Territory of Hawaii. *Pub. Health Rep.* 51: 1533-1556 (1936).
- (25) Holdenried, R.: A population study of the long-eared chipmunk (*Eutamias quadrimaculatus*) in the central Sierra Nevada. *J. Mammal.* 21: 405-411 (1940).

*A policy of kindness to patients, established a hundred years ago by the founders of the pioneer Federal mental hospital, survives the test of time and experience.*

## St. Elizabeths Centennial

By WINFRED OVERHOLSER

THE INSTITUTION known today as St. Elizabeths was established in Washington, D. C., 100 years ago, March 3, 1855, as the Government Hospital for the Insane. The change of names, a consequence of popular usage, is characteristic of a policy which has distinguished its practice since the great humanitarian, Dorothea Lynde Dix, penned the words which Congress approved in the basic legislation: "Its object shall be the most humane care and enlightened curative treatment of the insane of the Army and Navy of the United States, and of the District of Columbia."

The name St. Elizabeths was applied originally by early Maryland settlers to a tract of land which was occupied eventually by the hospital. When a part of the original building, now known as the center building, was used for surgical care of patients from the Union Army, it was called St. Elizabeths Hospital. Patients and staff eventually applied the gentle name to the entire institution. In 1868, Dr. Charles H. Nichols, the hospital's first superintendent, commented on the "happy circumstance that gave this establishment a designation of so much beauty and of such sacred association." In 1916, the Congress made the title official.

In the past 100 years, there have been many

advances in the care of the mental patient—technical, institutional, administrative, medical, legal, and social advances—with St. Elizabeths often in the forefront. The hospital has been the originator of many contributions to mental health. But its first contribution, the concept of kindness, formulated by Dorothea Dix, remains outstanding.

The atmosphere of kindness earned St. Elizabeths the title of "The Hospital with a Heart," from Sam Stavisky in an article published in *Colliers* magazine. The patients are given as much latitude as their condition warrants. They experience restraint only when they may injure themselves or others.

The administration of Howard Hall, the maximum security section of the hospital, reflects this policy in a place where it might seem least likely to succeed. The patients there, many of them under criminal charges, are considered to require close observation, yet they successfully conduct a limited form of self-government.

Once a month, the Howard Hall patients participate in an "administrative meeting," conducted by officials other than those engaged in treatment. It offers patients an opportunity to air their opinions and discontent and to have their suggestions and complaints discussed by fellow patients.

These patients also publish their own journal, a mimeographed magazine, edited, illustrated, and duplicated entirely by and written almost exclusively for patients in that hall. Last De-

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ember, the *Howard Hall Journal* reprinted from the *American Mercury* an article, "Medicine is Curing Me of Crime," written by its former editor. An example of a patient's contribution to the *Howard Hall Journal* is the brief statement on the following page, giving a patient's experience with, and reaction to, television programs.

Patients are encouraged to offer administrative suggestions and criticisms in their journal, and these suggestions are carefully reviewed by the superintendent for constructive guidance. This is true also of *The Elizabethan* published by and for patients in other branches of the hospital. Although the superintendent has found and used constructive suggestions in these publications, their pages are relatively free of critical comment.

Other contributions of St. Elizabeths have been reported elsewhere. St. Elizabeths pioneered the use of malaria fever for treatment of paresis, hydrotherapy, the use of a photographic department, pathologic museums as an adjunct of training, a psychological laboratory, forensic psychiatry, and the therapeutic value of the creative arts and crafts including the psychodrama. In 1942, St. Elizabeths was the first public mental hospital to use the psychodrama as developed by Moreno.

St. Elizabeths is today pursuing with high hopes the application of drugs which appear to bring about a therapeutic effect with their ability to quiet and relax the patients. On the other hand, it looks with great skepticism on such drastic therapies as shock treatment and lobotomy.

St. Elizabeths is distinguished, in another sense, by the fact that its chief administrator, the superintendent, has always been a professional psychiatrist. This practice conforms with the principles laid down by Dorothea Dix. The American Psychiatric Association has for years advocated that the administrative head of a mental hospital should be a psychiatrist. Superintendents of St. Elizabeths all have been honored with the presidency of the American Psychiatric Association.

The importance of having a professional psychiatrist at the head of any mental hospital is based on the principle that all details of administration are part of the psychiatric treatment.

The situation is not comparable with that of a general hospital. Every item of finance is subject to consideration by a physician of the effect on medical care of the patients. Although 40 percent of the staff of 2,500 have no direct contact with the patients, all contribute to the patients' welfare and receive some instruction as to behavior whenever they come in touch incidentally with the patients.

St. Elizabeths is a complex of more than 50 principal buildings occupying 360 acres on a hill across the Anacostia River. The view from its parks and porches surveys the Capitol, the Washington Monument, and the memorials to Jefferson and Lincoln. Its facilities include a firehouse, a library, a beauty parlor, several cafeterias, a private railroad for carrying coal to the steam plant, an incinerator, a police and fire department, a laundry, 9 kitchens, and a 400-acre farm a few miles away at Oxon Hill, Md. The assessed value of this property is in the neighborhood of \$18,000,000, although it could not be duplicated for that sum. The new geriatric building alone represents an investment of \$3,500,000.

The hospital population is in the neighborhood of 7,500. The admissions are approximately 1,500 a year; discharges are about 1,000 a year. A majority of the discharged patients leave after a stay of no more than a few months, although one patient recently was discharged as cured after 26 years' residence. Roughly, a fourth of those admitted have been patients in a mental hospital on earlier occasions.

A hundred years ago the official view was that not more than 250 beds should be the capacity of any mental hospital. The original plans for St. Elizabeths called for about 90 beds. But with the growth of the population, St. Elizabeths has reflected the increasing number of patients eligible for admission to St. Elizabeths. As noted originally the hospital was intended to accommodate only personnel from the defense forces and, incidentally, residents of the District of Columbia. Today it is authorized to receive patients from more than 20 sources, including Indian reservations, veterans from the Soldiers' Home, and others in beneficial relation to the Federal Government.

Scientific advancement in the treatment of mental patients has helped to offset the rise in

admissions. Effective treatment and prevention of paresis has reduced the number of patients suffering from that disease from about 6 percent of the admissions to almost zero. In common with other mental hospitals, St. Elizabeths has been receiving an increasing proportion of aged patients. Nearly 40 percent of the hospital's admissions today are persons above 60 years of age.

With the opening this summer of the new Dorothea Lynde Dix Pavilion, an admission and treatment building, there will be greater opportunity for improving diagnosis of patients upon admission. This will permit a greater degree of intense individual attention with the possibility that the patient may be cured and discharged that much more promptly.

In addition to the recognized psychiatric treatment, St. Elizabeths has long been known for its careful attention to the physiological basis of mental illness and for its generally comprehensive interest in patient health. It is the only public mental hospital in the United States which is approved for a rotating internship, in recognition of the high caliber of performance and equipment at its medical and surgical

building. Interns at this hospital do their pediatric and obstetrical and laboratory work at other hospitals.

In appraising the accomplishments of St. Elizabeths, it is difficult to assign credit to any particular technique. Studies of the value of psychotherapy are always difficult to frame. The response of the patient may result from a variety of factors. Although some techniques, such as drug therapy, appear to give a relatively clear-cut basis of evaluation, the complications of the individual personality frustrate most efforts at evaluation of treatment. Intensive attention to the individual is the key to improvement. This conviction dates back to the hospital's report for 1888 which regarded individual attention to the patient as more important than anything else.

No less important than the new diagnostic center, the Dix Pavilion, is the plan for revised and improved statistical methods of analyzing patients on a cohort basis. When this plan is applied, new facts will be ready to aid in the evaluation of mental hospital care. St. Elizabeths is confident that the facts will justify its traditional policy.

## *The World on a String*

*A mental patient's views on television are here reprinted with minor editorial change from the journal written and published by residents of Howard Hall, St. Elizabeths Hospital. They illustrate the character of creative expression in the Howard Hall Journal, and they suggest also the opportunity for evaluating the influence of TV programs on mental health, both in and out of the hospital.*

This is one of those rare cases where the mountain comes to Mohammed. Only in this instance it is we, the hospital shut-ins, that are unable to go to the mountain, and it really isn't a mountain at all, it's the outer world. To us shut-ins, the world is divided into two parts, our own little isolated inside world and the outer world of people free to pursue their ends. One of the major problems to a shut-in is not that he is a shut-in, but rather that the outer

world is shut out. Perhaps most of us can understand and accept the fact that because of varying degrees of mental illness we are, out of necessity, shut-ins, but what many of us find so difficult to accept and understand is why so much of the outer world is shut out. Fortunately, we are not alone with our problems, for the administrative doctors of Howard Hall are well aware of our dilemma as evidenced by their unceasing efforts to bring to us as

much of the outer world as is practically possible. Certainly they are aware of our psychological need for contact with the outer world. One of the steps taken by the administration has done more to alleviate this situation than all others combined.

They presented us patients with the world on a string. They have brought the outer world, in all its entirety, into our recreational day rooms!

An ordinary, common garden variety electric world is the string that is tied to the world which in turn is enmeshed in a small, square box: a television receiver! With a twist of the wrist and a flip of a dial, the outer world flows to meet our eyes! Mohammed's mountain was mere child's play in comparison with our wondrous little box. Instantaneously we are in the midst of a downtown crowd watching the parade of the Legionnaires, or we are riding in a brand new 1955 auto or watching the sports attraction of the day. There's the news and we are in Korea and then swiftly join a group of firemen in Chicago; then on to Washington for a meeting with the President and his Cabinet. We see the latest fashions and meet the outstanding personalities of the day. All of these things would be impossible were it not for this amazing little box.

One would think that the ability of this small box to bring the outer world to us is miracle enough, but no; it doesn't stop there. It goes beyond just mechanical function. It has dynamic effect on our morale, attitude, and emotions. It assumes a therapeutic role in every sense of the word. The rollicking laughter

that echoes down the hall when favorite comedians perform, the anxiety expression that comes with suspense and the intentness of concentration that comes with drama and quiz show are emotional entertainment. Our miraculous box constantly reminds us that there are comfortable living rooms with families gathered around a dinner table; that there are happy people, situations and circumstances. This serves to jar us out of the "just existing" attitudes and probes and jabs at our slumbering will to get well and "go home." It serves as a deterrent to keep the mind from becoming single tracked or in a rut or as some of us say, "institutionalized."

For it brings to us, at the exact moment, events that are taking place; it expands our isolated little community until it is as vast in scope as is the outer world. To those of us who are convalescing, it helps to prepare us for our return to society. It keeps us abreast of the times and the pulse of things so that when we do reach this outer world it is not a strange and unfamiliar place to adjust to. It gives its viewers a mutual sense of participation and interest. Educationally, its lessons are extensive in that it teaches us and gives plenty of practice in dem-

ocratic relationships with our fellow men. The selection of TV committees, scheduling programs, and the operation of the TV set help form the habit patterns of cooperative group spirit, teaching us to respect the other fellow's opinions, rights, and privileges.

In pausing to consider the significant role TV plays in our shut-in world, one can readily agree that this ingenious little box should never be taken for granted or underestimated. And in realizing the importance of TV, we should also take precautionary measures to insure its continued future use. A deeper sense of responsibility for this "World on a String" should be accepted by us all. We must all adjust ourselves to our neighbors' desires, opinions, and preferences so that all of us may enjoy the benefits of it without infringing upon the rights and privileges of fellow patients. In doing this we not only create more viewing pleasure for ourselves and others but we insure continued performance by our mechanical friend. Most important, it will give all of us practice and experience in getting along in a community of people. It will have its therapeutic effect and this is of primary concern to us shut-ins.

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## PHS Staff Announcements

**Dr. Louis C. McCabe** has been appointed staff adviser on air pollution to Mark D. Hollis, Assistant Surgeon General and chief engineer officer of the Public Health Service. Since 1951, Dr. McCabe has been chief of the Fuels and Explosives Division, Bureau of Mines, Department of the Interior. He served for 2 years as director of the Los Angeles County Air Pollution Control District.

**Arthur C. Stern**, formerly chief industrial hygiene engineer of the New York State Department of Labor, has assumed direction of the Public Health Service program of air pollution research and technical assistance to States and local agencies. He will be stationed at the Robert A. Taft Sanitary Engineering Center, Cincinnati.

# The Health Maintenance Clinic Program of the Fife-Hamill Memorial Health Center.

By GULDEN MACKMULL, M.D., HYMAN MENDUKE, Ph.D., and JOSEPH J. CAVA, M.D.

A HEALTH maintenance clinic was established in 1948 at the Fife-Hamill Memorial Health Center by the department of preventive medicine of the Jefferson Medical College of Philadelphia.

Persons presumed to be healthy were to be registered at the clinic for periodic physical examination and instruction in health habits and proper hygiene as well as advice on environmental, economic, and personal problems relating to the early detection of health hazards or prodromes of disease.

The existence of the clinic was publicized by local South Philadelphia newspapers, parent-teacher associations, handbills taken home by school children, and by public health nurses.

A comprehensive history and environmental

details were obtained for each individual on his first visit to the clinic. This was followed routinely (1) by a complete physical examination, including pelvic examination in women, a complete blood count, urinalysis, serology for syphilis, stool examination for parasites, and X-ray of the chest. Special laboratory tests were made when indicated. As far as practicable, home visits were made by public health nurses accompanied by senior medical students of the medical college. These contacts permitted a personal appraisal of pertinent environmental factors which influenced the final disposition of cases.

After the initial examination, recommendations concerning the patient were given. If no disorders were discovered, the person was offered advice calculated to help maintain health, and he was urged to return for reexamination, usually within a year. When some disorder was discovered, pertinent suggestions were made, and the individual was referred to his personal physician, hospital clinic, or to an appropriate agency best suited for handling the particular problem.

The time elapsing between the initial and the return visit depended on the individual situation. At most it was a year. At this second examination, recommendations were reiterated, or new advice was offered if necessary. All persons were notified by mail several weeks before the date of the reexamination; notification was frequently repeated by a telephone call the day before the appointment date.

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*Drs. Mackmull, Menduke, and Cava are closely associated with the Jefferson Medical College of Philadelphia and with the college's health maintenance clinic program at the Fife-Hamill Memorial Health Center. Dr. Mackmull, assistant professor of preventive medicine, is chief of clinic and director of the division of clinical preventive medicine at the center. The associate director, Dr. Cava, is instructor in medicine and clinical assistant in preventive medicine. Dr. Menduke, assistant professor of biostatistics, serves the health maintenance clinic as statistical consultant. The center is located at Scranton and Delancey Streets, Philadelphia.*

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## Area Served by the Clinic

Most of the patients included in this study lived in the section of Philadelphia between Chestnut and Mifflin Streets on the north and south and between the Delaware River and Broad Street on the east and west. This area in southeast Philadelphia has a total population of about 110,000, and the age, sex, and race composition is similar to that of the city as a whole. Roughly four-fifths of the population in both the clinic area and the city are white; the clinic area has, however, a higher proportion of foreign-born individuals, among whom Italians predominate. Approximately two-thirds of the white residents and practically all the nonwhite residents are financially eligible for the service of the clinic. Eligibility for clinic services is restricted to persons whose annual income is \$3,500, or less.

This part of the city is generally recognized as one of the worst problem areas in Philadelphia. It is characterized by poverty, lack of education, inadequate housing and sanitation, as well as by high morbidity and mortality rates (2-4).

## The First Clinic Visit

This report is based on a study of the first 1,500 consecutive patients who made their initial visits to the clinic between September 1948 and February 1953. These patients included 207 white men, 1,050 white women, 29 nonwhite men, and 214 nonwhite women, representing respectively 0.8, 4.1, 0.4, and 2.7 percent of the financially eligible population in each group.

Women predominated in every age group, with highest representation among white women 20 to 49 years old and nonwhite women 12 to 19. In general, individuals 50 years and older were poorly represented in the clinic census.

The individual's motivation for clinic attendance was either asked specifically of each patient or deduced from his history. Despite the admitted unreliability of this method, patients were considered subjectively "ill" if they knew of the existence of a specific illness or sought aid because of definite complaints. They were considered subjectively "well" if no specific complaint was volunteered.

If the individuals' statements can be trusted, almost half believed themselves "well" and actually came for health maintenance. The percentage who considered themselves "well" was slightly higher for white men than for white women and considerably higher for the younger than for the older persons in both racial groups.

The higher proportion of younger individuals in the clinic census who thought they were in good health may be attributed either to health consciousness indoctrinated recently in school or to the fact that young persons are really more healthy. Despite the poor representation of nonwhite persons, nonwhite women, 12 to 19 years of age, had a relatively high representation in the clinic census. A large proportion of this group came to the clinic presumably in good health.

It is not particularly surprising that 97 percent of those who considered themselves ill on the first visit really required medical attention. However, it is highly significant that three-fourths of the presumably well white men and practically all the presumably well women, particularly those 20 years of age and over, were found also to need medical care.

In all, 93 percent of the allegedly well really required treatment. Of all 1,500 patients, only 75, or 5 percent, were found to be free of medical, dental, or mental conditions. But 127 individuals, or 8 percent, could be considered in this category if caries of the teeth and pregnancy were not included as conditions warranting treatment. As was expected, the percentage of persons requiring medical attention was lower for the young than for the old, lower for men than for women, and lower for white than for nonwhite persons.

While the clinic was able to inform 23 persons that they were laboring under a misapprehension in believing themselves to be ill, 655 who thought they were well actually required medical guidance. Hence, there is no question as to whether the health maintenance clinic is fulfilling its purpose in the early detection of disease.

## Number of Diseases Per Patient

Commonly a patient requiring medical help suffered from more than a single disorder.



# The Health Maintenance Clinic Program of the Fife-Hamill Memorial Health Center.

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## Area Served by the Clinic

Most of the patients included in this study lived in the section of Philadelphia between Chestnut and Mifflin Streets on the north and south and between the Delaware River and Broad Street on the east and west. This area in southeast Philadelphia has a total population of about 110,000, and the age, sex, and race composition is similar to that of the city as a whole. Roughly four-fifths of the population in both the clinic area and the city are white; the clinic area has, however, a higher proportion of foreign-born individuals, among whom Italians predominate. Approximately two-thirds of the white residents and practically all the nonwhite residents are financially eligible for the service of the clinic. Eligibility for clinic services is restricted to persons whose annual income is \$3,500, or less.

This part of the city is generally recognized as one of the worst problem areas in Philadelphia. It is characterized by poverty, lack of education, inadequate housing and sanitation, as well as by high morbidity and mortality rates (2-4).

## The First Clinic Visit

This report is based on a study of the first 1,500 consecutive patients who made their initial visits to the clinic between September 1948 and February 1953. These patients included 207 white men, 1,050 white women, 29 nonwhite men, and 214 nonwhite women, representing respectively 0.8, 4.1, 0.4, and 2.7 percent of the financially eligible population in each group.

Women predominated in every age group, with highest representation among white women 20 to 49 years old and nonwhite women 12 to 19. In general, individuals 50 years and older were poorly represented in the clinic census.

The individual's motivation for clinic attendance was either asked specifically of each patient or deduced from his history. Despite the admitted unreliability of this method, patients were considered subjectively "ill" if they knew of the existence of a specific illness or sought aid because of definite complaints. They were considered subjectively "well" if no specific complaint was volunteered.

If the individuals' statements can be trusted, almost half believed themselves "well" and actually came for health maintenance. The percentage who considered themselves "well" was slightly higher for white men than for white women and considerably higher for the younger than for the older persons in both racial groups.

The higher proportion of younger individuals in the clinic census who thought they were in good health may be attributed either to health consciousness indoctrinated recently in school or to the fact that young persons are really more healthy. Despite the poor representation of nonwhite persons, nonwhite women, 12 to 19 years of age, had a relatively high representation in the clinic census. A large proportion of this group came to the clinic presumably in good health.

It is not particularly surprising that 97 percent of those who considered themselves ill on the first visit really required medical attention. However, it is highly significant that three-fourths of the presumably well white men and practically all the presumably well women, particularly those 20 years of age and over, were found also to need medical care.

In all, 93 percent of the allegedly well really required treatment. Of all 1,500 patients, only 75, or 5 percent, were found to be free of medical, dental, or mental conditions. But 127 individuals, or 8 percent, could be considered in this category if caries of the teeth and pregnancy were not included as conditions warranting treatment. As was expected, the percentage of persons requiring medical attention was lower for the young than for the old, lower for men than for women, and lower for white than for nonwhite persons.

While the clinic was able to inform 23 persons that they were laboring under a misapprehension in believing themselves to be ill, 655 who thought they were well actually required medical guidance. Hence, there is no question as to whether the health maintenance clinic is fulfilling its purpose in the early detection of disease.

## Number of Diseases Per Patient

Commonly a patient requiring medical help suffered from more than a single disorder.

Some had as many as 7. The modal and median number was 2. This was true whether or not dental caries and pregnancy were included. There were only 52 individuals for whom the sole finding was caries or pregnancy, or both. In most cases, caries or pregnancy or both conditions were found in conjunction with other complaints. Including caries and pregnancy, the 1,500 patients reported here accounted for 3,288 medical conditions. If dental caries and pregnancy are excluded from the computation, the number is reduced to 2,906.

Table 1 shows no striking differences either between races or sexes in the incidence of multi-

**Table 1. Number of illnesses<sup>1</sup> per patient by age, sex, and race in 1,500 patients**

Age group and number of illnesses	Percentage of total patients in each age group			
	White		Nonwhite	
	Men	Women	Men	Women
<i>12 to 19 years</i>				
0.....	41	20	( <sup>2</sup> )	24
1.....	37	52	( <sup>2</sup> )	37
2.....	22	20	( <sup>2</sup> )	26
3.....	0	6	( <sup>2</sup> )	9
4 to 7.....	0	2	( <sup>2</sup> )	4
Total.....	100	100	-----	100
<i>20 to 49 years</i>				
0.....	16	5	( <sup>2</sup> )	6
1.....	32	30	( <sup>2</sup> )	34
2.....	34	35	( <sup>2</sup> )	26
3.....	14	20	( <sup>2</sup> )	25
4 to 7.....	4	10	( <sup>2</sup> )	9
Total.....	100	100	-----	100
<i>50 years and over</i>				
0.....	12	3	( <sup>2</sup> )	( <sup>2</sup> )
1.....	9	16	( <sup>2</sup> )	( <sup>2</sup> )
2.....	35	33	( <sup>2</sup> )	( <sup>2</sup> )
3.....	26	33	( <sup>2</sup> )	( <sup>2</sup> )
4 to 7.....	18	15	( <sup>2</sup> )	( <sup>2</sup> )
Total.....	100	100	-----	-----
<i>All ages</i>				
0.....	20	5	28	10
1.....	30	30	24	33
2.....	32	34	24	26
3.....	13	21	21	21
4 to 7.....	5	10	3	10
Total.....	100	100	100	100

<sup>1</sup> Exclusive of dental caries and pregnancy.

<sup>2</sup> Percentages not computed when there were fewer than 20 patients.

ple illnesses. There was, however, a disparity between the sexes with respect to the presence or absence of disease: A higher proportion of the men were found healthy. As was anticipated, the incidence of multiple disease increased with the age of the patient. Boys and girls in the 12- to 19-year-old age group tended to have no illness or only one. Adults in the 20- to 49-age group tended to have 1 or 2 disorders and in the 50 and over category 2, 3, or more diseases.

Medical conditions found in the 1,500 individuals are tabulated in table 2. Obviously not all conditions could be itemized separately. Frequency of incidence constituted the main criterion for the compilation of this table, which follows a topographic classification (5).

A wide variety of medical conditions was observed, a substantial number of which were discovered in patients who were unaware of their medical problems.

For example, all cases of cervical erosion, cervical polyps, ovarian cysts (4 patients), cancer (3 patients), hypochromic anemia, intestinal parasites, gastric ulcer, and cholecystitis were diagnosed as a direct result of the efforts of the clinic. In addition, between three-tenths and nine-tenths of all uterine tumors, chronic cystic mastitis, dental conditions, malnutrition, diabetes mellitus, syphilis, hypertension, valvular heart disease, and goiter were presumably unknown to the patient before his first clinic visit.

Although such subdivision into conditions known and unknown to the patient is admittedly subject to error, there is little doubt that without the clinic examination a substantial number of illnesses would have been discovered only at a more advanced stage.

### Referrals After First Visit

Although 1,500 persons accounted for 3,288 medical conditions, the number of individual referrals, 2,842, was smaller, since the hospital or family physician, could in many instances take care of more than one complaint (see table 3). The number of referrals ranged from none in the 75 healthy clients to as many as 5 for the patients needing treatment.

For the healthy person a variety of advice

**Table 2. Incidence of medical conditions, in 1,500 patients**

Conditions, by topographic classification	Number
Body as a whole.....	788
Psyche (primarily anxiety states but including 6 psychoses).....	338
Body (primarily obesity and malnutrition but including 31 syphilis).....	450
Integumentary system.....	61
Musculoskeletal system.....	70
Respiratory system.....	118
Asthma and hay fever.....	97
Tuberculosis of lungs.....	17
Bronchiectasis.....	4
Cardiovascular system.....	294
Valvular heart disease.....	136
Hypertension.....	89
Varicose veins.....	45
Miscellaneous.....	24
Hemic and lymphatic systems (all were hypochromic anemias).....	304
Digestive system.....	512
Diseases of teeth and gums, mostly caries.....	337
Hemorrhoids.....	70
Hernia.....	31
Intestinal parasites.....	27
Duodenal ulcer.....	20
Cholecystitis.....	14
Enlarged tonsils.....	10
Gastric ulcer.....	3
Urogenital system.....	899
Urinary, including 162 cystoceles.....	207
Female genital, including 417 cervical erosions and 122 rectoceles.....	666
Male genital.....	26
Endocrine system.....	121
Menopausal syndrome.....	45
Goiter.....	41
Diabetes mellitus.....	25
Miscellaneous.....	10
Organs of special sense (eye and ear) <sup>1</sup> .....	76
Total <sup>2</sup> .....	3, 243

<sup>1</sup> Includes only those individuals requiring eye refraction who had never worn eyeglasses before. <sup>2</sup> In addition, there were 45 pregnancies for a grand total of 3,288 medical conditions.

was given. He was admonished, for example, to restrict or omit smoking or alcoholic beverages. Suggestions were offered, or actual arrangements were made with various agencies for a more appropriate job. Interviews with schools or special vocational training classes were arranged, and appointments were made

with officials of the Philadelphia Department of Public Assistance for conferences on increased financial aid.

The mode was 2 referrals per patient. The most frequent referrals were those made for services available in hospitals and for consultation with the nutritionist and gynecologist at the health center.

### Return Visits

For a health maintenance clinic to be of greatest benefit, it is essential that return visits be made periodically. Therefore, it is of great interest to examine the record of the appointments which were kept or broken during the study period. It is equally important to compare the return attendance of those, the apparently healthy, who were told they did not need treatment with those, found to be ill, who were actually referred to some agency for therapy.

The 75 healthy individuals were given a total of 160 appointments for return visits. Thirty-three of these appointments, 21 percent, were kept, and 23 persons returned at least once.

The 1,425 ill patients received 3,857 appointments and actually kept 1,255, or 32 percent.

These return visits were tabulated through 1953.

It would appear that although neither group was particularly conscientious about keeping appointments for reexamination, the ill patients were somewhat more regular than the healthy. Records often showed that clients

**Table 3. Disposition of 1,500 cases**

Referred to—	Number	Percent
Health center.....	2, 114	74
Nutritionist.....	830	29
Gynecologist.....	699	24
Dentist.....	268	9
Ophthalmologist.....	1 242	9
For health maintenance advice only.....	75	3
Hospitals.....	2 676	24
Family physicians.....	30	1
Social agencies.....	22	1
Total.....	2, 842	100

<sup>1</sup> Includes 30 individuals who had never worn eyeglasses before. <sup>2</sup> Primarily clinic referrals but includes 24 referred to psychiatrist.

would miss one appointment but would keep the next appointment. Therefore, an individual who kept an appointment within 2 years of this tabulation (1952 and 1953) was considered as still being served by the clinic. By the same reasoning, anyone failing to keep an appointment for 2 years was presumed to be separated from the clinic.

Obviously, the health maintenance clinic was able to do little for those who never returned for periodic examinations. A total of 37 percent of the healthy and 33 percent of the ill fell into this category. These figures exclude individuals who made their initial visit within 2 years of the termination of this study.

It is encouraging that more than half of the 1,500 individuals are still currently associated with the clinic. The record is somewhat better for the healthy than for the ill—57 percent for the former and 51 percent for the latter.

Of the 23 healthy individuals who were re-examined, only 6, or 26 percent, were found to have remained healthy on every return visit. It is impossible to say from present data whether this is a high or a low percentage. The figure is higher than the 5 percent who were found healthy on the first visit, but the comparison is not a fair one.

### Evaluation of Results

Despite the convenient location of the Fife-Hamill Memorial Health Center in a problem area, only a small percentage of the financially eligible population availed itself of the services of the health maintenance clinic. A number of probable reasons for the low attendance can be advanced.

Known, or suspected, presence of illness is a powerful stimulus for an individual to seek medical attention. He accepts, usually without question, the therapeutic measures offered by a hospital outpatient department or by his private physician. On the other hand, a health maintenance clinic offers only a combination of health education, assurance, and personal interest on the part of the staff. Thus, such a program does not sell itself as readily as that of a conventional clinic.

The dental profession has been rather successful with its slogan "See Your Dentist Twice a Year." Well-baby clinics are now firmly estab-

lished. However, a similar program with respect to a "well-adult" clinic has not yet won wide acceptance among the general population or the medical profession. Therefore, before it can hope to succeed, the program offered by an adult health maintenance clinic must be sold and resold to the public over a number of years. One way is to have the public health nurse visit frequently the homes of actual or potential clients in order to explain the importance of periodic physical check-ups. When such contact is reduced or discontinued, the attendance of a health maintenance clinic suffers.

A professionally organized and properly executed health education program is essential for the operation of a health center. Such a program in full operation would enlist more clientele and assure a larger percentage of return visits. Lack of funds alone has prevented the Fife-Hamill Memorial Health Center, in general, and its health maintenance clinic, in particular, from enjoying such a program.

Periodic examinations are essential for a program of health maintenance. The overall number of return visits at the clinic was discouragingly low. Only 1 out of 5 appointments was kept by those healthy on the first visit and 1 out of 3 for those classed as ill on the first visit. Encouraging is the fact that half of all patients returned at least once. An additional 16 percent may yet return since their initial visit was made within the last 2 years.

Such a clinic may attract patients initially through publicity and maintain attendance to some extent through the efforts of the public health nurse. In the long run, however, clinic growth depends on word-of-mouth referrals by satisfied clients. The number of new patients should increase each year. Our program fell short in this respect. During the period covered, the number of new patients each year remained quite constant with an average of approximately 340.

The low attendance of men is difficult to explain. Only 8 of each 1,000 eligible white men came to the clinic, but the rate for white women was 5 times as high. Among nonwhite persons, where preventive medicine is most needed, men were even more poorly represented. Perhaps of importance is the inconvenience of attending the clinic during working hours, despite the fact

that many employers allow employees to attend clinics without loss of pay.

It is quite probable that 26 percent (6 out of 23) is a biased estimate of the proportion of the clinic census who remained healthy on every return visit. An individual who continues to feel well would be no doubt less likely to return than one who becomes aware of symptoms. No control group is currently available for comparison, and we are unaware of available figures for similar programs. In order to draw a proper conclusion, it would be necessary to trace the history of a similar group of healthy people to whom no health maintenance advice was given. In any event, the period covered by this study is quite short.

Early detection of disease, while ordinarily thought of as a correction rather than prevention, is preventive medicine in the sense that more serious developments are forestalled, or their effects are minimized. Medical conditions were discovered in 93 percent of the individuals who thought of themselves as well before examination showed they were not. The clinic seems, therefore, to have fulfilled its secondary role quite satisfactorily since without examination most conditions probably would not have been discovered until a more advanced stage.

Patients requiring treatment were referred to various agencies (table 3) since no therapy was given at the health maintenance clinic. Because financial eligibility for clinic attendance precluded accepting patients whose annual income exceeded \$3,500, it is not surprising that only 30 (1 percent) were referred to private physicians. Utilization of readily available facilities in nearby hospitals has become habitual with many of these families. Individuals requiring nutrition services were referred to the health center nutritionist since practical dietary guidance programs are not usually available in hospitals. The exceptionally large number of gynecologic consultations can be explained by the predominance of women in the child-bearing age (68 percent of the clinic census) and by the routine inclusion of pelvic examinations.

Occasionally, criticism has been made of a health maintenance clinic in that a false sense of security may be given to those not found to be ill. Periodic health examinations are essential if disease is to be discovered in the presymp-

tomatic stage. A false sense of security on the part of the patient is avoidable by including in the recommendations an explanation of the limitations of predictive diagnosis.

### Summary and Conclusions

A health maintenance clinic for adults was established at the Fife-Hamill Memorial Health Center, Philadelphia, by the department of preventive medicine of the Jefferson Medical College of Philadelphia. The primary and secondary purposes of the clinic were the maintenance of health and the early detection of disease by means of periodic examinations of presumably healthy adults in the lower income population of the area served. Considered a health problem area, the geographic site served by the clinic is characterized by low levels of education and income, by substandard housing, and by high morbidity and mortality rates.

This study represents an analysis of the first 1,500 consecutive patients who consulted the clinic initially between September 1948 and February 1953. Return visits were tabulated through 1953. These patients represent only a small proportion of the financially eligible population of the area (annual income below \$3,500). White women 20 to 49 years of age predominated in the clinic census.

On the first visit to the clinic, although half of the patients thought of themselves as being well, almost every patient required treatment of some kind.

These 1,500 persons accounted for more than 3,000 conditions with mode and median of 2 per person. Multiplicity of conditions increased with age.

Only 75 persons (5 percent) appeared in good health and required no specific medical treatment.

Roughly half of all patients actually returned at least once for reexamination. An additional 16 percent visited the clinic initially within the past 2 years.

Of 23 healthy patients who were examined 1 or more times, only 6 were found to have remained healthy.

Because of insufficient data and lack of a control group, the role played by this clinic in

the prevention of disease remains equivocal. The success in early detection of disease appears established.

There is need for more concerted effort toward education in health maintenance through cooperation with private practitioners, school and public health agencies, hospitals and clinics, churches, social agencies, employers and other persons interested in public health.

#### REFERENCES

- (1) Mackmull, G., Cava, J. J., and Perkins, W. H.:  
An experiment in the maintenance of positive

health. *Pennsylvania Med. J.* 53: 1182-1184, November 1950.

- (2) U. S. Bureau of the Census: 1950 United States census of population. Census tract statistics, Philadelphia. Bull. P-D 42. Washington, D. C., U. S. Government Printing Office, 1952.
- (3) Philadelphia Tuberculosis and Health Association: Tuberculosis by Philadelphia census tracts. Philadelphia, The Association, 1953.
- (4) Philadelphia Department of Public Health: Annual report, 1950. Table D-20. Philadelphia, The Department, 1951, p. 20.
- (5) National Conference on Medical Nomenclature: Standard nomenclature of diseases and operations. Ed. 4. New York, Blakiston Co., 1952.

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### Legal Note on Procedural Due Process

In *L. A. Darling v. Water Resources Commission*, 67 NW 2d 890, decided January 12, 1955, by the Supreme Court of Michigan, an order of the State commission was held invalid on the ground that the alleged polluters had not been afforded procedural due process.

The record of the "hearing" before the commission covering pollution of underground water disclosed that witnesses were not sworn, that no exhibits were identified, and that the commission relied on materials and data which were not introduced at the hearing and made no findings of fact.

The court said:

"The legislature's right under the police power to regulate the contamination of waters of this State is not in question, but the exercise of such power does not obviate the necessity to recognize the due process clauses of our State and Federal Constitutions. When the legislature created a 7-man commission, composed of 4 State officials and 3 citizens, it undoubtedly expected it to conduct a proper and legal hearing before issuing an order, such as was issued in this case, that appellant change its method of doing business at an expenditure of a large sum of money.

"The legislature provided for an appeal from the decision and order of the commission to the circuit court and that said appeal would be determined in chancery as a trial *de novo*. This provision did not obviate the necessity of a proper legal hearing before the commission. It did not contemplate that the failure of the commission to hold a proper hearing should be corrected by appeal. The legislature gave to the court the right and duty to pass judgment upon the decision and order of the commission based on the record of such proceedings before said commission."

*When exposed to running sea water, the clam uses its own filtering system to cleanse itself of sewage bacteria ingested in polluted waters. How this is accomplished was demonstrated in a series of experiments conducted by the Shellfish Sanitation Laboratory.*

## Self-Purification of the Soft Clam *Mya arenaria*

By WILLIAM ARCISZ and C. B. KELLY

DURING the past decade the supplies of the soft clam, *Mya arenaria*, have become seriously depleted. Attempts made by biologists (1) to increase clam populations to their former abundance by establishing clam farms and reseeding depleted areas have met with little or no success. However, large supplies of clams in areas which are polluted with domestic sewage are available.

The possibility of ridding shellfish of undesirable bacteria has been given some attention ever since epidemiological evidence indicated that shellfish from waters subject to fecal pollution were responsible for enteric disease (2). That polluted shellfish can be made safe for human consumption by the process of purification has been adequately demonstrated by Fabre-Domergue (3), Wells (4), and Dodgson (5).

Purification is a mechanical process effected

by the physiological functioning of the shellfish in clean water. When shellfish are feeding, the gills act as a filter to strain out some of the material that may be brought in by the water which passes through them. If this water contains sewage, some of the micro-organisms in it are entrapped in the mucus on the body of the shellfish and transferred to the alimentary tract. Some of these are perhaps utilized as food (6) and the others discharged from the body in the form of feces and pseudofeces. When shellfish from polluted water are placed in clean water, the sewage bacteria are eliminated from the shellfish, and, since no more are ingested, purification is accomplished.

Two purification processes, based on the ability of shellfish to cleanse themselves, have been evolved:

*Natural purification or relaying.* Shellfish from polluted areas are transplanted into clean waters and allowed to purify themselves. This method of natural purification is widely used in the oyster industry. However, many biological factors combine to make it generally infeasible for use with soft clams.

*Artificial purification or cleansing.* Shellfish from polluted areas are placed in tanks which are filled with water that has been sterilized by filtration, chlorination, or by ozone. The water

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*Mr. Arcisz is bacteriologist at the Public Health Service Shellfish Sanitation Laboratory, Pensacola, Fla., and Mr. Kelly is chief of the laboratory. Other studies in this series of reports on shellfish experiments conducted by the laboratory have appeared in Public Health Reports, August 1954 (p. 716) and December 1954 (p. 1205).*

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may be drawn and replaced or recirculated after sterilization. The shellfish are kept in these tanks until purified. Cleansing of polluted clams has been practiced in Massachusetts for a number of years (2, 7).

Investigations by Galtsoff (8), Sandholzer (9), Dodgson (5), and others (10) have shown that shellfish are extremely sensitive to chlorine, slight amounts slowing down or completely inhibiting molluscan physiological processes. The Public Health Service Shellfish Sanitation Laboratory at its Woods Hole, Mass., location therefore undertook the investigation of purification rates of soft clams, using clean sea water obtained from a normally pollution-free source. The source of this water was Great Harbor, a sheltered continuation of Vineyard Sound, in Woods Hole, Mass.

### Biological Activity of the Clam

The biological activities of the clam are of particular importance in considering pollution and purification of this species of shellfish.

The clam lives in burrows on the marine bottom between the high-water mark and as far as the 40-fathom mark. Although a substantial quantity of clams are taken in 1 to 2 fathoms of water, the bulk of the commercially available supply is obtained from the intertidal zone, that is, between the high- and low-water marks.

The clam obtains its food from the overlying water. Buried in the soil, the clam extrudes its "neck" which contains two connected tubes, the inhalant and exhalant siphons. The water which enters the inhalant siphon flows into the mantle chamber, passes through the basketlike gills and thence out of the exhalant siphon.

In addition to the function of respiration, the gills of the clam are used for food collecting. The gill filaments are lined with microscopic cilia which strain out minute forms of animal and plant life which serve the clam as food. These minute forms, when caught by the cilia, are bound together with mucus and normally transported by ciliary action to the edge of the gills and thence to the mouth by way of the labial palps. After passing through the stomach and intestine, the fecal material is extruded near the inner opening of the exhalant siphon through which it is discharged into the water.

The clam can protect itself from taking extraneous or noxious matter into its stomach. It can either close its siphon, or, if the noxious matter has entered the siphon, expel it by forcibly ejecting the matter as pseudofeces out of the inhalant siphon; or it can transport noxious matter by ciliary action away from the palps and thrust it out of the mantle at the pedal opening.

In view of this, it is quite obvious that the bacterial content of a clam is dependent on the bacterial density of the water in which the clam is resident and to a large degree on the amount of water the clam passes through itself. No data are available as to the exact amounts of water a clam filters in 24 hours. However, the work of Galtsoff (11), Loosanoff (12), and others indicates that, although there are individual differences in animals, an oyster may pass a maximum of 3.9 liters to a maximum of 20 liters per hour under normal conditions.

Temperature of the surrounding water plays an important role as to the amount of water an oyster or quahog will filter. Observations of Galtsoff (13) and Loosanoff (14) indicate that oysters become almost inactive at 6° C., or below. In contrast, the work of Belding (15) and Marston (16) demonstrates that clams are active and will "drink" for considerable periods at a water temperature below 39° F. (3.9° C.).

An important aid to sanitation is the fact that, just as the clam ingests bacteria, so, if placed in pure water, it will eventually free itself from bacteria. The question of primary interest is: How long does this take?

In order to answer this question, two series of experiments were conducted. The first of these experiments was made to determine the role of water pumping activity of the clam on purification. The second series of experiments was made to determine whether temperature of the water had any effect on the purification rate of clams.

### Water Pumping Activity

The amount of water pumped through a shellfish is a factor in how rapidly an animal can be polluted and, conversely, how rapidly it can be purified. Unfortunately, no adequate methods are available for measuring the amount

of water which the clam can pump through itself. Insertion of tubes into the inhalant and exhalant siphons by surgical means for the purpose of measuring water flow, although feasible, is not satisfactory, since the ciliary action of these apertures is disturbed.

The carmine cone method of Galtsoff (17) and the cornmeal method used by Dodgson (5) and by Marston (16), which can be used to indicate pumping, were not considered suitable for use in our experiments. Since it is not feasible to measure quantitatively the amounts of water pumped through a clam, the most practical index of pumping activity appeared to be "openness" or "closedness" of the inhalant and exhalant siphons. For our purposes, an animal was considered to be pumping when its inhalant and exhalant siphons were open, and not pumping when both these orifices were closed.

It can be pointed out that this method may not be an accurate measure of pumping activity, if an analogy with measurement of pumping activity of oysters by the use of shell movement is made. Kymograph records, using "shell movement" as a measure of pumping activity, would indicate the passage of large volumes of water through an animal. However, observations of Loosanoff and Engle (18) on feeding of oysters, indicated that, under unfavorable conditions (heavy concentrations of organisms in the water), there was no correlation between the amount of water pumped and the kymograph record of shell movement. In their studies, they used the rubber dam technique of Nelson (19) by which the amount of water passed through an oyster can be accurately measured.

In our experiments, clams of 2½ to 3 inches in length were obtained from a commercial source and placed in an upright position in numbered, gridded trays, containing 98 to 144 animals. After being exposed to polluted water for 3 to 6 days, the clams in the trays were brought into the laboratory and washed with clean sea water. The trays were then placed into a wooden aquarium containing flowing sea water which was kept at all times 3 inches higher than the uppermost portion of the clam shells.

At 15-minute intervals the clams were ob-

served for activity, which was noted as active or inactive. Owing to the sporadic activity of individual clams, it was difficult to obtain "lots" of shellfish which were 100 percent "active" and 100 percent "inactive" for any protracted length of time. Therefore, for sampling purposes, it was found necessary to class clams showing the least activity as inactive and clams which showed the least inactivity as active samples.

The average results of two clam purification runs conducted at temperatures from 17.5° C. (63.5° F.) to 18° C. (66° F.) are illustrated in figure 1.

It can be seen that coliform content of the more active animals is reduced more rapidly than that of the less active animals for the first 5 hours. However, it can be noted that after the 5th hour the "active" clams became progressively less active and the "inactive" clams conversely became more active, so that at the end of 14 hours the "active" group was inactive for 2½ hours and the "inactive" group had been active for 3 hours. This probably explains the fluctuations in the coliform content of the "active" and "inactive" clams from the 5th to the 14th hour. In the 14 hours of observation, there was enough activity even among the less active animals to effect a significant reduction of bacteria.

#### Temperature Effect on Purification

Marston (16) has shown that *Mya arenaria* can actively feed at water temperatures below 39° F. (3.9° C.) and even at 35° F. (1.7° C.), and that it can ingest bacteria as readily at 37° F. (2.8° C.) as at 73° F. (22.8° C.).

Studies soon to be published, conducted by the Shellfish Sanitation Laboratory, in which the rates of accumulation of pollution in oysters (*Crassostrea virginica*), quahogs (*Venus mercenaria*), and clams (*Mya arenaria*) were studied, show that there is a correlation between the amount of pollution accumulated and the temperature.

In view of these observations, a series of six experiments was conducted at Woods Hole during 1952 and 1953 to determine whether temperature had the same effect on the purification rate of clams as it did on their pollution.

*Escherichia coli* was chosen as the representa-

tive coliform organism. Since no data are available on the rates of cleansing of enteric pathogens from clams, *Salmonella schottmuel-leri* was chosen as a representative of this group. *S. schottmuel-leri* proved to be an excellent indicator organism for these studies, since our purification waters, usually of excellent bacterial quality, were occasionally subject to coliform pollution.

These studies were conducted in a small-scale purification plant (fig. 2). Clams from a commercial source, measuring between 2½ to 3 inches in length, were placed in heavy wire trays supported by 2-inch metal legs. Fifty clams were placed in each tray. Four trays were then placed in a wooden aquarium containing a wooden dam. The capacity of the aquarium was 200 liters of sea water, maintained at a height of 3 inches over the uppermost portions of the clam shells. The clams were held in this aquarium for a 48-hour acclimatization period

during which they were continuously bathed with flowing sea water. Dead and weak animals were removed and replaced with healthy ones during this period of time.

At the beginning of each experiment the aquarium was drained and accumulated detritus on the clams and in the aquarium flushed out by a gentle hosing with sea water. The trays of clams were removed, and the aquarium was refilled with 200 liters of sea water. Bacterial suspensions of *E. coli* and *S. schottmuel-leri*, calculated to give the overlying water a density of 10,000 *E. coli* and 1,000 *S. schottmuel-leri* per 100 milliliters, were added. After a thorough mixing of the water, the 4 trays containing a total of 200 animals were placed in the aquarium. The animals were allowed to "drink" the polluted water for a period of 6 to 10 hours. The aquarium was drained and the shellfish placed in enamelware buckets and stored overnight. The aquarium and trays used in the

Figure 1. Effect of activity on reduction of coliforms in active and inactive clams. Numbers in parentheses indicate time in hours active or inactive.

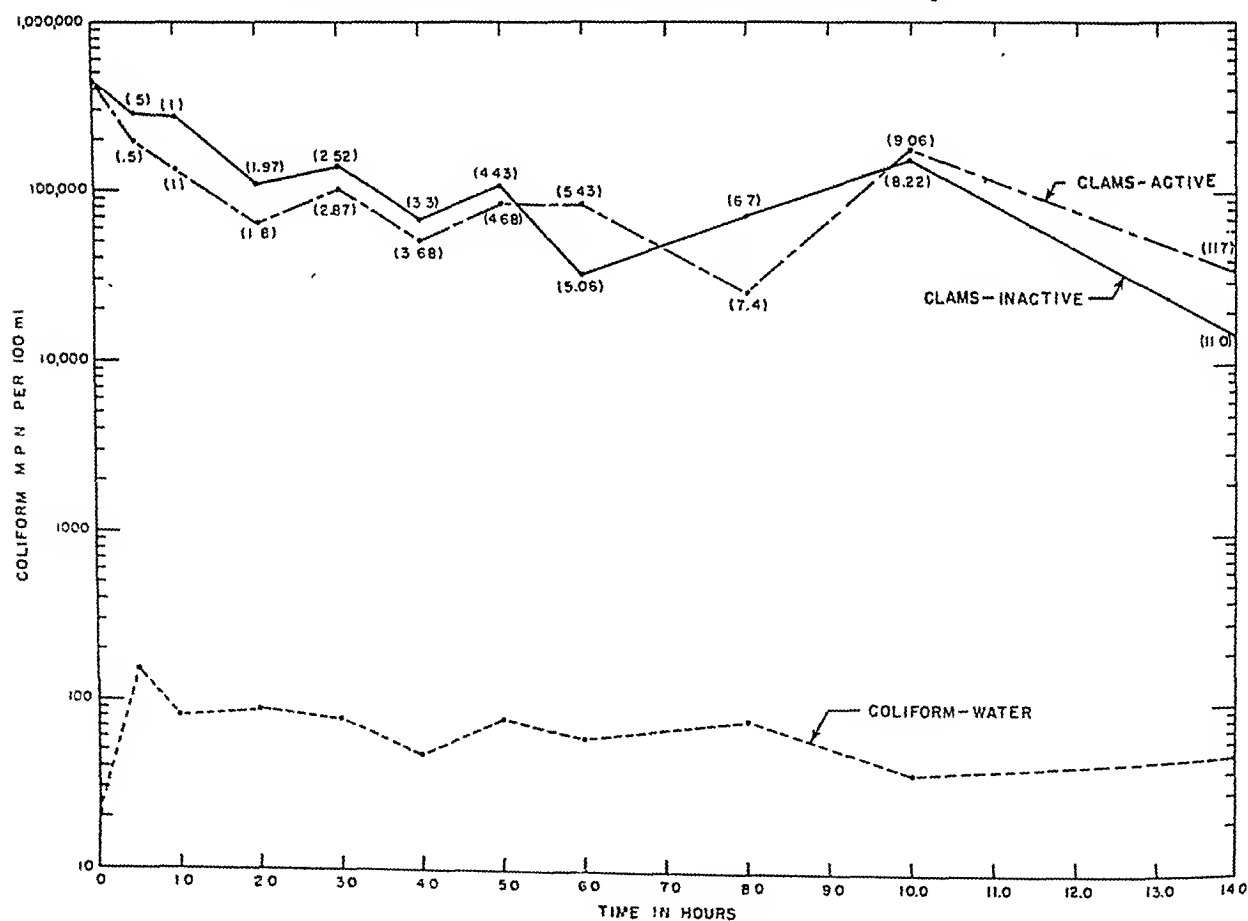
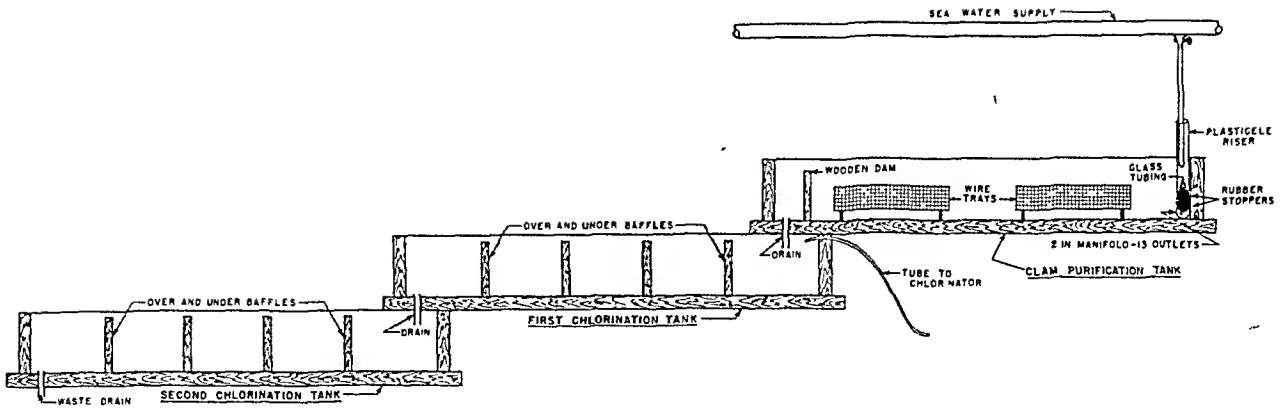


Figure 2. Pilot clam purification plant.



pollution were sterilized for 1 hour with chlorinated water maintained at 100 p.p.m. residual. The sterilized material was then rinsed by flowing sea water for a period of 18 hours.

After overnight storage at room temperature, the clams were replaced in the wire trays and immersed in the aquarium. The rate of flow of sea water was adjusted to 200 liters per hour, or 1 liter per animal per hour. This flow of water was maintained for the duration of the experiment.

To insure that no viable salmonella would be discharged into the receiving harbor, the effluent water from the purification tank was chlorinated by a solution-feed hypochlorinator. Sufficient chlorine was applied to produce a residual of at least 10 parts per million after a detention time of 2 hours in a series of 2 baffled, effluent treatment tanks.

With the exception of a few minor modifications, the bacteriological methods used for the examination of clams and water were those recommended by the American Public Health Association (20). Quantitative estimation of bacterial densities was conducted by the dilution method in which at least 4 decimal dilutions—5 tubes for each dilution—were used.

The method for enumerating *S. schottmuel-leri* involved enrichment in Galton's (21) modification of Kauffman's brilliant green tetrathionate broth, with isolation of typical colonies from brilliant green agar. The test was completed by confirmation on Russell's double sugar agar, with occasional confirmation serologically, using salmonella group B antiserum.

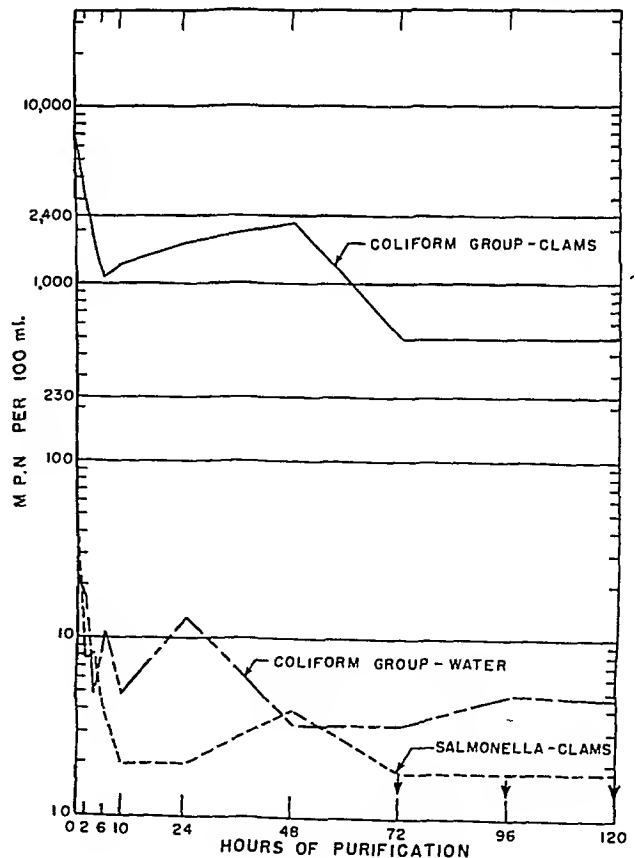
The test for enumerating coliforms consisted

of preliminary plantings in lactose broth, with confirmation in brilliant green lactose bile broth.

Results of tests for both organisms were expressed as most probable numbers (MPN) per 100 milliliters, according to Hoskin's tables (22).

Samples of clams and overlying waters were

Figure 3. Purification of soft clams—Experiment 1. Water temperature range 2.5–4° C.



taken at designated intervals and examined for the presence of coliforms and salmonellae. Sampling was terminated when two consecutive samples showed the absence of salmonellae in the lowest dilution planted.

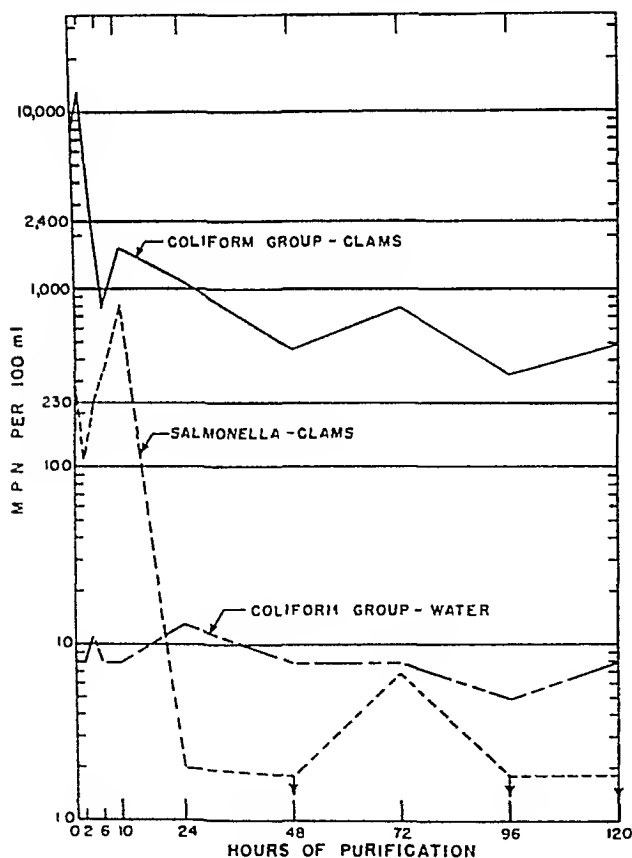
### Results of Experiments

The results of these experiments are presented in a series of six figures.

Figures 3 and 4 show the results of experiments conducted at water temperature ranges of 2.5°–4.0° C. (36.5°–39.2° F.) and 3.5°–4.5° C. (38.3°–40.1° F.).

Figures 5, 6, 7, and 8 give the results at temperatures of 13° C. (54.5° F.), 15° C. (59.0° F.), 18° C. (64.4° F.), and 20° C. (68.0° F.), respectively.

**Figure 4. Purification of soft clams—Experiment 2. Water temperature range 3.5–4.5° C.**



Figures 3 and 4, illustrating the reaction of clams to purification at low temperatures, indicate that the reduction of coliforms in both experiments is similar. There is a similarity in

the rapid initial drop and the subsequent leveling off. Although the initial concentration of *S. schottmuelleri* is roughly 10 times less in experiment 1 than in experiment 2, the time required for complete purging of this organism is 3 and 4 days, respectively.

**Figure 5. Purification of soft clams—Experiment 3. Water temperature 13° C.**

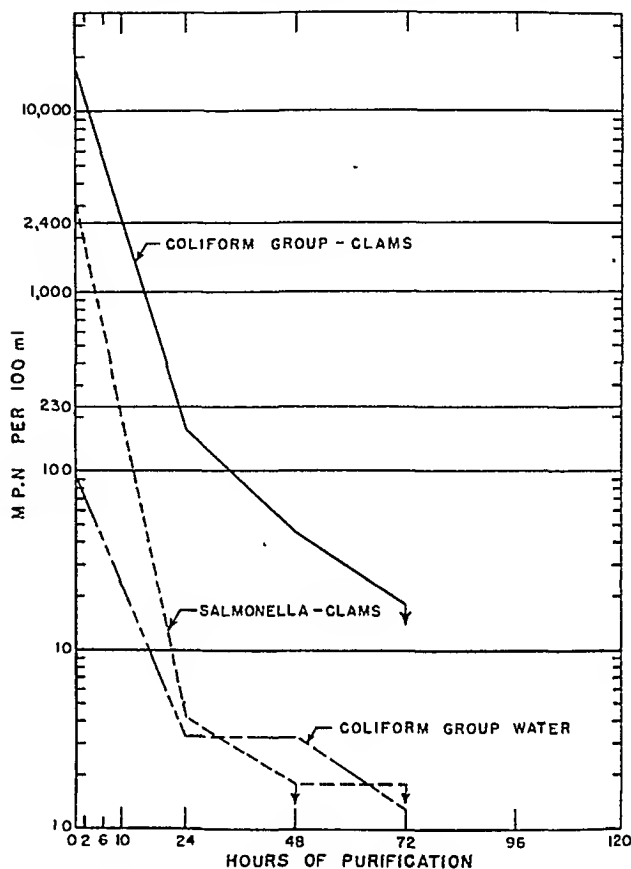
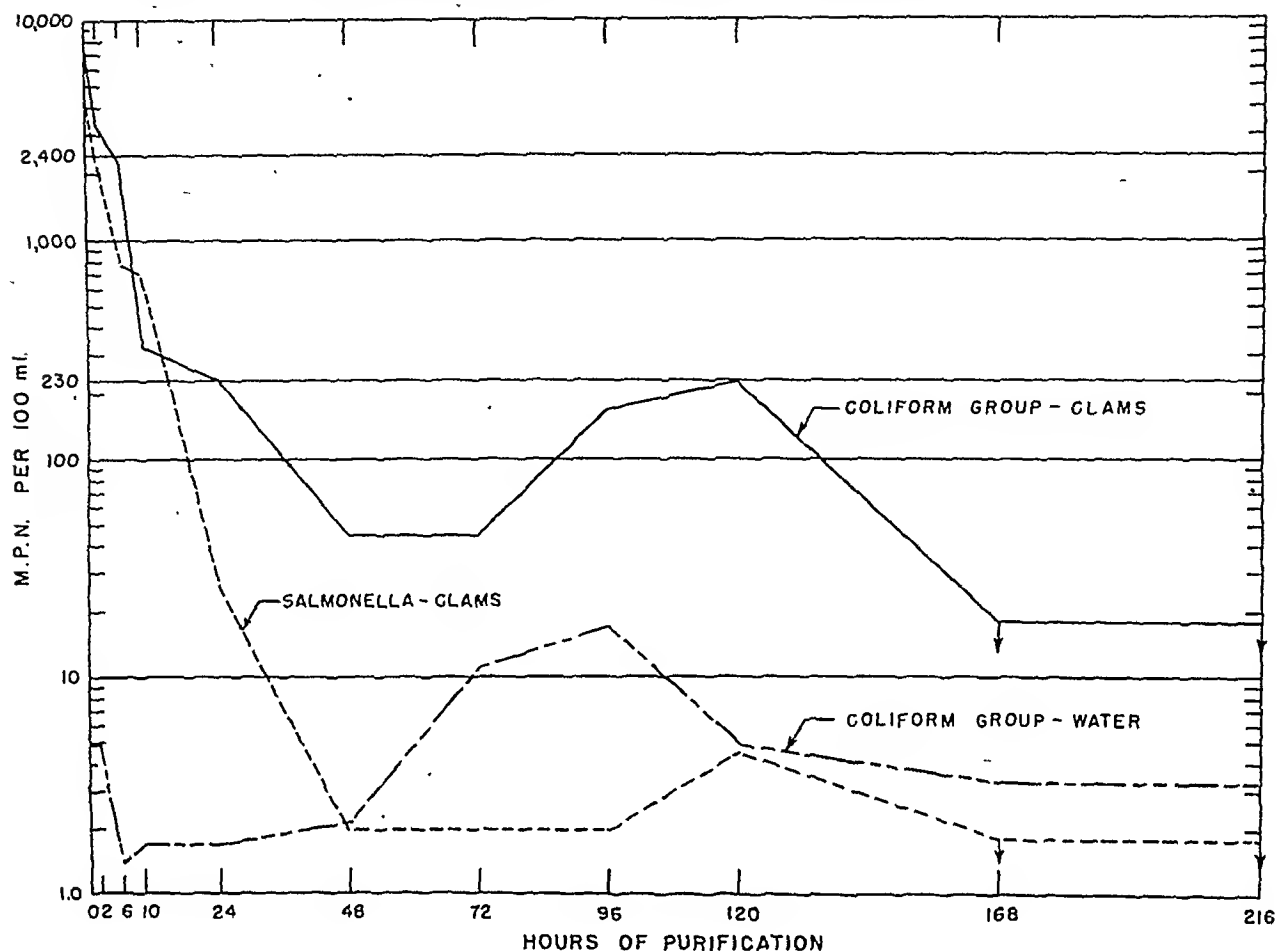


Figure 5 shows that at 13° C. clams containing an initial concentration of 17,000 coliforms and 3,300 *S. schottmuelleri* were purged of the latter in 2 days. No explanation for the indeterminate level of less than 18 coliforms per 100 milliliters which was effected in 3 days can be made, in view of other experiments in which the coliform content of the water was generally low, other than perhaps the clams were more active during this experiment.

Figure 6 shows the results of an experiment in which there were no apparent differences in the physical or biological quality of the water from that illustrated in figure 5, other than a 2-degree rise in temperature. Animals containing an initial concentration of 7,900 coliforms

Figure 6. Purification of soft clams—Experiment 4. Water temperature 15° C.



and 4,600 salmonellae per 100 milliliters showed a rapid decrease of both organisms. However, the clams showed presence of salmonellae for 5 days. Complete purging occurred between the 5th and 7th days.

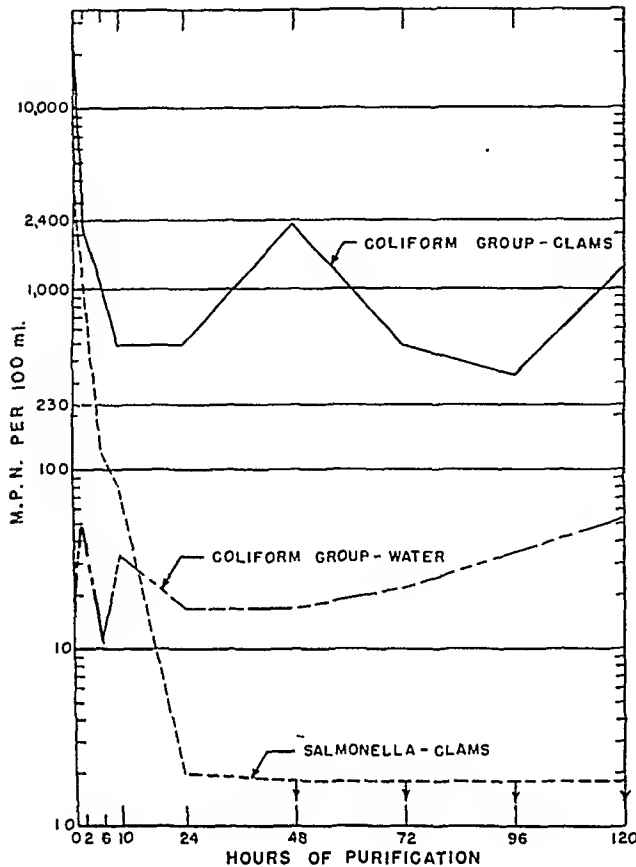
Figure 7 shows that clams having an initial concentration of 22,500 coliforms and 3,300 salmonellae were purged of salmonellae in 48 hours. The coliform content decreased but fluctuated with the water coliform content.

Figure 8 illustrates the effect of occasional pollution of an otherwise satisfactory water supply. Clams containing an initial concentration of 33,000 coliforms and 6.1 salmonellae per 100 milliliters were rid of the salmonellae in 24 hours. Although a reduction of coliforms in the clams did occur, it is not as rapid or as great in magnitude as that occurring in experiments in which the coliform-load of the purifying water was lower.

## Discussion

The data which have been presented in this report demonstrate that contaminated clams can be purified by exposure to a continuous flow of clean sea water. There is a suggestion that the activity of the clams may play a part in the length of time required for purification. However, even the least active animals studied showed significant decreases in bacterial loads within the purification time employed in the usual clam treatment processes. It is also apparent that the clam can purify itself as effectively at 2.5° C. (34.5° F.) as it can at 20° C. (68° F.). The initial concentrations of polluting organisms used appear to have no influence so far as the length of time necessary for purification is concerned. That enteric pathogens, as represented by *S. schottmuelleri*, can be purged from contaminated clams has been adequately demonstrated. However, although these

Figure 7. Purification of soft clams—Experiment 5. Water temperature 18° C.



data indicate that purification is feasible, a discussion of certain regulatory, economic, and esthetic aspects of clam purification is indicated.

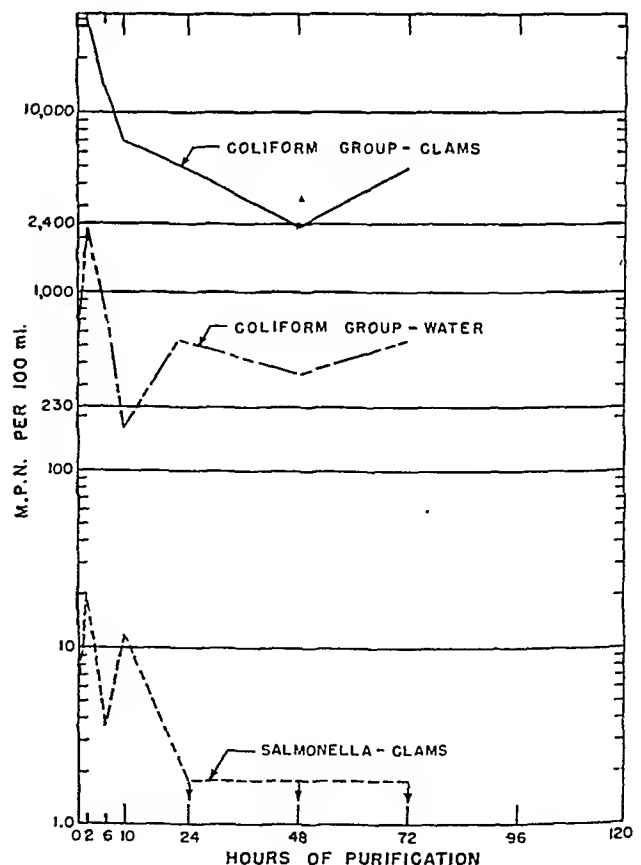
The use of water containing a chlorine residual of 0.05 p.p.m., or more, for purification of shellfish (23) is not supported by the findings of Dodgson (5), Galtsoff (8), Sandholzer (9), nor of the Massachusetts Special Commission Investigating Shellfish Purification (10), which demonstrated that chlorine, even in small amounts, can interfere with or inhibit molluscan physiological processes.

During our experiments, the coliform content of polluted clams usually was reduced to, or below, the recommended limiting coliform MPN of 2,400 per 100 milliliters (23) in 24 hours or less. Because this level of purification was accomplished with water of low coliform content, there is little doubt that using a water of drinking water quality, as recommended in the Public Health Service manual (23), a coliform MPN considerably less than 2,400 could be at-

tained. *S. schottmuelleri* was usually present in the clams in substantial numbers at the time the limiting coliform value was attained. However, at 24 hours and thereafter, *S. schottmuelleri* was irregularly present and only in small numbers at low and medium temperature purifications. Whether the demonstration of these salmonellae at irregular times after 24 hours' purification was due to recontamination of the clams with organisms retained in the experimental apparatus or whether the salmonellae were continuously resident in the animals cannot be determined at this time, and therefore the sanitary significance of their presence is in question.

The economic aspects of shellfish purification are a limiting factor. Finding a source of pollution-free water near areas where polluted clams are found is somewhat of a problem. In most instances, natural waters close to areas where polluted clams are found are not suitable for purification purposes without preliminary

Figure 8. Purification of soft clams—Experiment 6. Water temperature 20° C.



sterilization. This is true in Massachusetts, where clam purification is being practiced at this time. Even if pollution-free waters are found, sporadic pollution of these waters makes the use of naturally clean waters unfeasible for purification purposes. Data gathered at Woods Hole have shown that waters of excellent bacterial quality are on occasion subject to sporadic pollution which can only be related to aquatic birds or runoff from terrestrial sources. However, the problem of finding a pollution-free source of water has been remedied at Conway, England, where water sterilized by chlorine and then dechlorinated has been used with considerable success for purifying mussels.

The efficacy of purification has been questioned from an esthetic viewpoint. It has been compared with dirty milk, containing large numbers of bacteria, which has been pasteurized.

Referring to mussel purification, Dodgson (5) states:

"The analogy between purification of polluted shellfish with the pasteurization of dirty milk would appear to be unsound. In the case of dirty milk, although pathogenic bacteria are, or should be killed by the process of pasteurization, nothing is actually abstracted from the milk, the 'dirt,' of whatever nature, e. g., faecal matter, and so forth—remaining therein. In other words, the milk remains a dirty food. In the case of mussels, however, the whole of the solid matter which they may contain in the intestines or elsewhere, e. g., faecal matter of sewage origin, etc., is eliminated by the shellfish, and got rid of by hosing."

### Summary and Conclusions

Polluted clams can be purified by exposure to running sea water of low coliform content, according to experiments conducted at the Public Health Service Shellfish Sanitation Laboratory, when it was located at Woods Hole, Mass.

Activity of the clam may play a part in the length of time required for purification. However, even the least active animals studied showed significant decreases in bacterial loads within the purification time employed in the usual clam treatment processes.

The clam is able to function and purify itself at water temperatures of 2.5° C. (34.5° F.) to 20° C. (68° F.).

The recommended coliform MPN of 2,400 per 100 milliliters for cleansed clams can usually be attained in 24 hours or less.

It has not been determined whether the few *Salmonella schottmuelleri* irregularly observed after 24 hours' purification were derived from organisms in the experimental apparatus and water or from those retained in the animal bodies.

Purification time was not materially influenced by the initial pollution loads in the clams used in these studies.

### REFERENCES

- (1) Woods Hole Oceanographic Institution: Report on investigation of the propagation of the soft-shell clam, *Mya arenaria*. Woods Hole Oceanographic Institution Contribution No. 462. Woods Hole, Mass., The Institution, 1948.
- (2) Shellfish [Report of the Committee of the Public Health Engineering Section of the American Public Health Association, L. M. Fisher, Chairman]. Am. J. Pub. Health 27: 180-196, Supp. March 1937.
- (3) Fabre-Domergue, M.: Bacterial purification of oysters in filtered sea water. Compt. rend. Acad. d. sc. Paris 154: 1257-1259 (1912).
- (4) Wells, W. F.: Artificial purification of oysters. Pub. Health Rep. 31: 1848-1852 (1916).
- (5) Dodgson, R. W.: Report on mussel purification. Ministry of Agriculture and Fisheries. Fishery Investigation Series 2, vol. 10, No. 1. London, The Ministry, 1928.
- (6) Zobell, C. E., and Landon, W. A.: Bacterial nutrition of the California mussel. Proc. Soc. Exper. Biol. and Med. 36: 607-609 (1937).
- (7) Fox, L.: Shellfish sanitation program of Massachusetts. Modern San. 6: 17 (1953).
- (8) Galtsoff, P. S.: Reaction of oysters to chlorination. Research Report 11. Washington, D. C., U. S. Fish and Wildlife Service, 1946.
- (9) Sandholzer, L. A., and Buckner, C. R. Bacteriological studies of oyster conditioning. Commercial Fisheries Review 9: 7-11 (1947).
- (10) Commonwealth of Massachusetts: Report of the special commission established to make an investigation and study relative to edible shellfish and shellfish chlorinating plants. House Document No. 1770. Boston, The Commonwealth of Massachusetts, 1948.
- (11) Galtsoff, P. S.: Experimental study of the functions of the oyster gills and its bearing on the problem of oyster culture and sanitary control. U. S. Bureau of Fisheries Bull. No. 46. Wash-



ington, D. C., U. S. Fish and Wildlife Service, 1928, pp. 1-39.

- (12) Loosanoff, V. L.: Rate of water pumping and shell movement of oysters in relation to temperature (abstract). *Anat. Rec.* 108: 620 (1950).
- (13) Galtsoff, P. S.: Biology of the oyster in relation to sanitation. *Am. J. Pub. Health* 26: 245-247 (1936).
- (14) Loosanoff, V. L.: Effect of temperature upon shell movement of clams, *Venus mercenaria* (L). *Biol. Bull.* 76: 171-182 (1939).
- (15) Belding, D. L.: The soft-shelled clam fishery of Massachusetts. Marine Fisheries Series No. 1. Boston, Commonwealth of Massachusetts, Dept. of Conservation, Div. of Fish and Game, Marine Fisheries Section, 1930.
- (16) Marston, A. T.: Preliminary experiments on the effect of temperature upon the ingestion of bacteria by the clam (*Mya arenaria*). Marine Fisheries Series No. 4. Boston, Commonwealth of Massachusetts, Dept. of Conservation, Div. Fish and Game, Marine Fisheries Section, 1931.
- (17) Galtsoff, P. S.: New methods to measure the rate of flow produced by the gills of oysters and other molluscs. *Science* 63: 233-234 (1926).
- (18) Loosanoff, V. L., and Ingle, J. B.: Effect of different concentrations of micro-organisms in the

feeding of oysters (*O. virginica*). U. S. Bureau of Fisheries Bull. 42. Washington, D. C., U. S. Fish and Wildlife Service, 1947.

- (19) Nelson, T. C.: Water filtration by the oyster and a new hormone effect upon the rate of flow. *Proc. Soc. Exper. Biol. and Med.* 34: 189-190 (1936).
- (20) Recommended procedure for the bacteriological examination of shellfish and shellfish waters. [Revision of recommended methods of procedure. Report of the Standard Methods Committee for the Examination of Shellfish of the American Public Health Association] *Am. J. Pub. Health* 37: 1121-1127 (1947).
- (21) Galton, M. M., Hardy, A. V., and Mitchell, R. B.: The public health laboratory diagnosis of enteric infections. *Am. J. Trop. Med.* 30: 77, January 1950.
- (22) Hoskins, J. K.: Most probable numbers for evaluation of coli-aerogenes tests by fermentation tube method. *Pub. Health Rep.* 49: 393-405 (1934).
- (23) U. S. Public Health Service: Manual of recommended practice for the sanitary control of the shellfish industry. Public Health Service Pub. No. 33 (formerly Pub. Health Bull. No. 295). Washington, D. C., U. S. Government Printing Office, 1950.

## PHS films

### Fundamentals of the Human Blood Groups

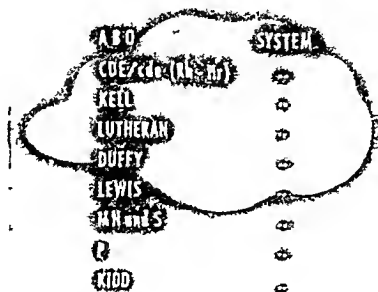
35 mm. filmstrip, sound, color, 15 minutes, 70 frames. 1954.

Audience: Pathologists, laboratory technicians, nurses, medical students, and physicians.

Available: Loan—Public Health Service, Communicable Disease Center, 50 7th St., NE., Atlanta 5, Ga. Purchase—United World Films, Inc., 1445 Park Ave., New York 29, N. Y.

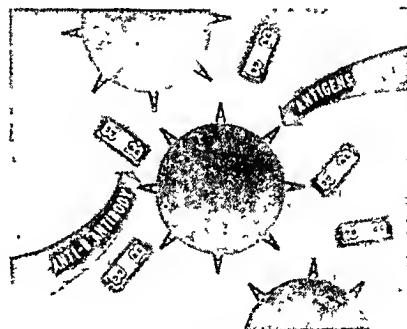
The fundamentals of blood typing are explained by symbols and stylized drawings in this filmstrip

The genetics of blood groups and the incompatibility of the various groups together with a description of "sensi-



All these blood group systems are inherited in a simple Mendelian manner.

tization" are features depicted. Precautions in giving transfusions are emphasized.



The serum of the B group individual always contains anti-A antibodies.

# technical publications

## Comprehensive Dental Care in a Group Practice

*Public Health Service Publication No. 395. 1954. 48 pages. 25 cents.*

Presented is a study of time and service requirements for giving complete dental care on a fee-for-service basis to patients who were members of Group Health Association, Inc., a prepayment medical care program in Washington, D. C.

In the study group were 1,925 persons of all age groups, including approximately equal numbers of males and females. Participation of individual patients during the 5-year period of the study averaged approximately 25 months. Initially each participant received treatment for all accrued needs and was subsequently sustained in a state of good dental health by periodic maintenance care.

## United States Participation in International Health

*Public Health Service Publication No. 416. 1954. 24 pages; illustrated.*

Through charts and explanatory notes, this pamphlet illustrates the role of the United States in the improvement of world health conditions. The United States has been concerned with health problems in other countries since 1902, when it participated in the development of the Pan American Sanitary Bureau. In 1942, the United States embarked upon its first bilateral technical assistance programs through the Institute of Inter-American Affairs. These programs are now conducted by the Foreign Operations Administration with the Public Health Service, through its Division of International Health, providing active support to the health components of the program.

The FOA-PHS health program is active in 38 countries in underde-

veloped areas, and its activities cover a wide spectrum. Primary emphasis is placed on training nationals and on controlling malaria, smallpox, yaws, and gastroenteric and parasitic diseases.

The pamphlet also describes the activities of the World Health Organization and the relationship of the Public Health Service to the participation of the United States in this international organization.

## State Mental Health Programs Planned for Fiscal 1954 and 1955

*Public Health Service Publication No. 374. 1954. 37 pages. 30 cents.*

Presented is a cross-section view of how the national health program is being advanced in the States. In addition to abstracts of State mental health program plans, it summarizes major needs and administrative problems pertinent to such programs. Included is a State by State listing which identifies the responsible administrative unit designated by each State as its mental health authority. The text is based on information supplied by the States.

## It's Good Business to Know Your Men

*Public Health Service Publication No. 379. 1954. 12 pages; illustrated. 10 cents.*

Mental health in industry is the subject of this new publication, which suggests how the foreman or supervisor can help to foster a healthy job environment for his workmen by understanding and applying basic mental health principles. It also suggests that he, as a key person, can best help the worker who has emotional problems by using fact and understanding rather than play-

ing the role of "amateur psychiatrist." Since the mental health of a person depends to a great extent on how he gets along in the work situation, the booklet is designed for both management and labor.

## An Industrial Waste Guide to the Meat Industry

*Public Health Service Publication No. 386. 1954. Prepared by the Committee on Meat Packing Plant Waste Disposal of the American Meat Institute in cooperation with the National Technical Task Committee on Industrial Wastes and the Public Health Service. 12 pages. 15 cents.*

Industrial wastes which cannot be eliminated must be disposed of in a suitable manner to protect the Nation's water resources. This pamphlet discusses the sources, quantity, and character of meat industry wastes, the water pollution these wastes can cause, and remedial measures for the control of meat industry pollutants. It is designed primarily as a practical guide for operating and design personnel within the industry itself.

This publication is a revision of the original guide prepared in 1943 by the Public Health Service and published in supplement D of the report, Ohio River Pollution Control. It is the second of a series of industrial waste guides prepared by the National Technical Task Committee in cooperation with the Public Health Service, as a part of the joint government-industry program to reduce water pollution through control of industrial wastes.

## How to Study Nursing Activities in a Patient Unit

*Public Health Service Publication No. 370. 1954. 48 pages. 25 cents.*

How much nurses' time is being diverted from patients to details that other personnel can do? This manual gives a method hospitals can use to study the time distribution of all nursing personnel assigned

# technical publications

to inpatient units. The method is similar to that described in the published manual dealing with the head nurse, entitled "The Head Nurse Looks at Her Job." The new manual is intended to help hospital administrators with the next logical step—gathering the information needed to plan better staffing of inpatient units—with the hope that it will save them the time required to devise their own study methods.

The method provides for a sampling of the activities of personnel every 15 minutes. It will provide reliable information on the activities that take the most time and a general picture of the kinds of activities performed by each category of personnel.

## Prenatal Health Examination Legislation—Analysis and Compilation of State Laws

*Public Health Service Publication No. 369, 1954. 55 pages. 25 cents.*

The Venereal Disease Program of the Public Health Service has compiled the laws requiring prenatal blood tests for syphilis which are now in effect in 42 States and 3 Territories. This publication reproduces these laws from the various legal reference sources of the States and Territories and includes citations for these sources.

In addition, the pamphlet contains a table showing the approval and effective dates of prenatal laws for each of the included States and Territories. It also reprints a paper entitled "Prenatal Health Examination Legislation—History and Analysis," by Laura M. Halse and Dominic V. Liberti. The original of the paper appeared in the February 1954 issue of *Public Health Reports*, pp. 105-110.

At the time the publication went to press, Alabama, the District of

Columbia, Maryland, Minnesota, Mississippi, Tennessee, Wisconsin, and Puerto Rico did not have prenatal laws requiring blood tests for syphilis.

## Handbook on Sanitation of Vessel Construction

*Public Health Service Publication No. 393, 1954. 70 pages; illustrated. 30 cents.*

Superseding "Principles of Sanitation Applicable to the Construction of New Vessels" dated June 1949, this handbook contains the minimum public health standards relating to the general sanitation and ratproofing of new vessels and vessels undergoing major reconstruction.

Included in the text are standards for the construction of potable water systems, wash water systems, overboard water systems, pressure water connections, food service spaces, plumbing, swimming pools, and crew and passenger accommodations.

The publication is prepared especially for the use of naval architects, shipbuilders, vessel-operating companies, the industries supplying materials and equipment for vessels, and others interested in sanitation aboard ship.

## Occupational Health and Safety Legislation

*Public Health Service Publication No. 357. 315 pages. \$1.25.*

Intended as a source of legislative reference, this compilation consists of citations and excerpts or digests of laws and regulations dealing with occupational health and safety. It represents a comprehensive revision of a multilithed publication entitled, "Industrial Health Legislation—a

Compilation of State Laws and Regulations," which was issued in limited quantity in 1950.

The present publication includes laws enacted up to and during the first half of 1953. Information on safety inspection and prevention of accidents has been included because lack of uniformity in the usage, coverage, and interpretation of such general terms as "health," "safety," and "sanitation" made it impossible to draw a sharp line of demarcation. No attempt has been made to evaluate the adequacy or effectiveness of the various provisions.

Pertinent information is given for all 48 States, the District of Columbia, Alaska, and Hawaii.

Laws dealing with selected aspects of worker health and safety were examined for the following State agencies: departments of health, labor, industrial relations, agriculture, and education; industrial accident commissions; bureaus and inspectors of mines; public utilities commissions; and a few others, such as State fire marshals for laws regulating health and safety in dry-cleaning establishments.

Selected subjects covered in the provisions include the following: authority and functions of agencies, general provisions relating to occupational health and safety, employment of women and minors, mines and mining, reporting of occupational diseases and injuries, workmen's compensation, vocational rehabilitation, and air pollution and nuisance control.

This section carries announcements of all new Public Health Service publications and of selected new publications on health topics prepared by other Federal Government agencies.

Publications for which prices are quoted are for sale by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. Orders should be accompanied by cash, check, or money order and should fully identify the publication. Public Health Service publications which do not carry price quotations, as well as single sample copies of those for which prices are shown, can be obtained without charge from the Public Inquiries Branch, Public Health Service, Washington 25, D. C.

The Public Health Service does not supply publications issued by other agencies.

*The lessons learned from an environmental study of a radium therapy clinic and a medical study of its staff may be applicable to any institution using radioactive materials.*

## Radioactive Contamination *in a radium therapy clinic*

By ROBERT G. GALLAGHER, MITCHELL R. ZAVON, M.D.,  
and HENRY N. DOYLE

THE PROPOSED REMOVAL of a radium therapy clinic in Baltimore, Md., to new quarters in 1952 presented the city's health department with an unusual and interesting public health problem: the need for assessing the radioactive contamination about the premises occupied by the clinic. Consequently, at the request of the health department's bureau of industrial hygiene, the Occupational Health Program, Public Health Service, assisted in making an environmental study of the clinic building and a medical study of its staff. Although radium therapy clinics are relatively

uncommon in the United States, the lessons learned from this experience seem to warrant a brief report.

### Historical Note

The clinic was organized in 1904 and made its first purchase of radium in December of that year. At one time, it possessed 5 grams of radium, then the world's largest single, privately owned supply. In 1914, the clinic started a radon emanation and purification plant to prepare radon applicators for therapeutic use. At that time the health hazards associated with radium were not fully appreciated, and practices that now would be considered extremely dangerous were then the normal procedure. It was not until 1918 that a radiochemist was employed to supervise the radon plant and chemical laboratory.

During the early years, the lack of more than minimal safety precautions may have been responsible for the death from aplastic anemia of 1 and possibly 2 radon pumpers. The radio-

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chemist had a nearly fatal attack of the same disease at about the same time, and soon thereafter additional safety precautions were instituted. Since that time no health damage has been reported.

Over the years, radon applicators were collected and given to various research laboratories for investigative purposes. Lord Rutherford and Sir James Chadwick, noted British physicists, used material from the clinic in their early work, which led to the discovery of the neutron (1). Thus, indirectly, the institution played an important role in the development of atomic energy.

### The Physical Plant

The clinic had been continuously located in a converted three-story brick, duplex residence. At one time, an adjacent building was used as a hospital for inpatient care. One-half of the clinic's duplex building was used primarily as offices and service rooms, and the other half housed laboratories and treatment rooms. Immediately behind and connected to the duplex was an added wooden structure which, on the second floor, contained a radiochemical laboratory and preparation, surgical, and treatment rooms. The radon emanation plant was contained in an elevated brick vault in the rear of an adjacent garden and was connected to the wooden structure by a walkway.

Two fires in recent years had gutted the wooden structure, and the latter of the fires had severely damaged the main building as well. Radiochemical equipment was involved in the second fire.

### Basic Physics

To insure that the reader understands the physical basis of the report, the pattern of radium decay is shown in table 1. Commencing with uranium and proceeding by natural radioactive decay processes to stable lead, the radioactive elements produce various radiations. Each of the elements has its own characteristic half-life, that is, the time in which one-half the material originally present will have decayed to the next lower substance in the series.

Radon, the seventh radioisotope in the series,

Table 1. The radium decay series

Radio-element	Historical name	Symbol	Half-life
Uranium--	Uranium I--	${}_{92}\text{U}^{238}(\text{UI})$	4.51 x 10 <sup>9</sup> years.
Thorium--	Uranium X <sub>1</sub> --	${}_{90}\text{Th}^{234}(\text{UX}_1)$	24.1 days.
Protactinium--	Uranium X <sub>2</sub> --	${}_{91}\text{Pa}^{234}(\text{UX}_2)$	1.14 minutes.
Uranium--	Uranium II--	${}_{92}\text{U}^{234}(\text{UII})$	2.32 x 10 <sup>5</sup> years.
Thorium--	Ionium-----	${}_{90}\text{Th}^{230}(\text{Io})$	8.3 x 10 <sup>4</sup> years.
Radium----	Radium-----	${}_{88}\text{Ra}^{226}$	1,600 years.
Radon----	Radon-----	${}_{86}\text{Rn}^{222}$	3.825 days.
Polonium--	Radium A--	${}_{84}\text{Po}^{218}(\text{RaA})$	3.05 minutes.
Lead-----	Radium B--	${}_{82}\text{Pb}^{214}(\text{RaB})$	26.8 minutes.
Bismuth----	Radium C--	${}_{83}\text{Bi}^{214}(\text{RaC})$	19.7 minutes.
Polonium--	Radium C'--	${}_{84}\text{Po}^{214}(\text{RaC}')$	1.5 x 10 <sup>-4</sup> seconds.
Thallium--	Radium C''--	${}_{81}\text{Tl}^{210}(\text{RaC}'')$	1.32 minutes.
Lead-----	Radium D--	${}_{82}\text{Pb}^{210}(\text{RaD})$	22.2 years.
Bismuth----	Radium E--	${}_{83}\text{Bi}^{210}(\text{RaE})$	4.97 days.
Polonium--	Radium F--	${}_{84}\text{Po}^{210}(\text{RaF})$	139 days.
Lead-----	Radium G--	${}_{82}\text{Pb}^{206}(\text{RaG})$	Stable
			23.6% abundance.

is a gas; all others are solid. The possibility of this gas spreading beyond its intended confines is ever present. It can then, on decay, settle out as a particulate in areas far removed from contaminated areas or be tracked from contaminated areas to places still farther removed. Sealed containers of radium prevent the escape of radon gas, and within a month after encapsulation the radon will reach equilibrium with were taken, positive identification of loose sur-  
sion of penetrating gamma radiation.

Gamma radiation is very penetrating in contradistinction to alpha radiation which can be stopped by a sheet of paper. Beta radiation is only slightly more penetrating than alpha, but the latter, because of its great ionizing power, is a serious hazard once introduced into the body as a contaminant. As may be seen from the table, radon quickly decays to produce radium C. So, in the absence of radium to replenish it, a given concentration of radon is soon depleted.

The clinic used both radium and radon sources for external and interstitial therapy. Multicurie amounts of radium in the form of

liquid radium bromide were used in the radon emanation plant for the production of radon seeds and needles. The radon was purified by freezing the impurities in liquid nitrogen and thence drawing it into glass bulbs or platinum needles. The seeds or needles were then delivered to the calibration room for activity determinations and thence to the treatment room or to a storage vault.

At the time of the survey, the number of patients treated at the clinic had been reduced; therefore, the radiation exposures received by personnel were proportionately reduced. It was possible, however, to observe some of the standard operating procedures, including the operation of the emanation plant, which was in limited production.

### **Radiation Contamination Survey**

A radiation contamination survey of the main building and of the adjacent building was made using instruments sensitive to alpha as well as beta and gamma radiation (a Samson alpha survey meter (SIC-49A) with a useful range corresponding to 200-25,000 alpha disintegrations per minute, an alpha-beta-gamma ion chamber (AN/PDR-T-34) with 5-50,000 mr./hr. scale, and a Geiger counter (SGM-2C) with maximum scale range of 20 mr./hr. beta-gamma). Simultaneously, wipe samples were taken in various areas throughout the clinic. These wipe samples, made by smearing 1¼-inch disks of Whatman No. 41 filter paper over approximately 100 square centimeters of surface, were used to estimate the extent of removable surface contamination. Each disk was numbered and kept carefully separated from the other disks until it was counted in a gas flow alpha proportional counter (NICC scaler with NHC PCC-10 converter).

No attempt was made in the survey to evaluate contamination on the surfaces of known sources of radiation, such as radium capsules. Only fixtures, floors, and other exposed surfaces were monitored and wiped.

Air samples were taken at the filtration and capsule preparation operations. The samples were collected with calibrated, portable Hudson and Willson pumps. Both membrane and Whatman No. 41 filter papers were used.

### **Survey Findings**

Materials containing removable alpha-emitting radiation were found throughout the clinic. In several areas the alpha contamination, resulting from the use of radioelements for almost half a century, was truly astounding. Counts as high as 30 million disintegrations per minute were recorded. This figure is in marked contrast to the 0-500 disintegrations per minute at present regarded as the maximum permissible level. Of the 30 million disintegrations per minute, removable contamination constituted 25,000 disintegrations per minute, considerably less than 30 million but certainly more significant than the fixed contamination because of the possibility of its being inhaled or ingested. A summary of the results of alpha counting on the first floor of the clinic is recorded in figures 1 and 2.

Furniture, carpets, floors, stairs, offices, and medical equipment were all found to be contaminated with radioactive materials. Although it was difficult to survey the burned areas of the building, wherever wipe samples were taken, positive identification of loose surface radioactivity was made. Radium contamination appeared to have been spread by water during the fire fighting and as a result of the subsequent traffic. The drains of several sinks, including that in the dining room, contained radioactivity.

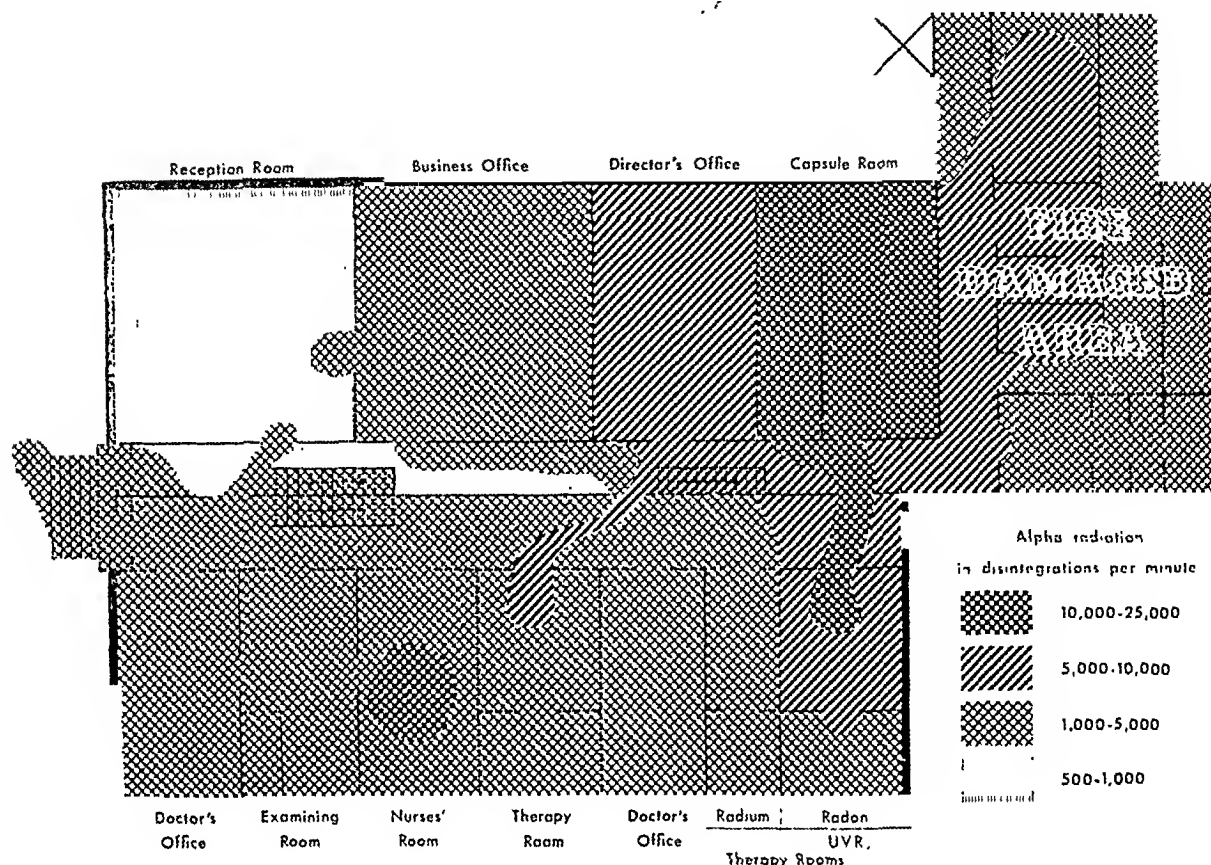
The adjacent building, which had been used as a hospital 15 years earlier, was also found to be contaminated with radioactive materials.

In the course of the survey, a misplaced radium source of approximately 40 millicuries was found in an office safe. In the same safe were several other sources in a strong box whose key had been misplaced years before. One of these sources contained 16 millicuries of radium. In another office, 6 "empty" radium capsules, each containing approximately 10 millicuries of activity, were found. A flask containing radium solution with 21 millicuries of activity was also located.

### **Personnel Monitoring**

Because of the cumulative nature of radiation exposures, occupational radiation dosages are a function of the length of employment as

Figure 1. First floor: Fixed radioactive contamination on floor surfaces.



well as the amount and manner in which the radioactive materials are handled by an individual. Personnel radiation monitoring was provided for staff members at the clinic by means of pocket chambers and film badges. Because alpha radiation is easily stopped, neither film badges nor pocket chambers are of value in estimating exposure to this type of radiation. They are of value for estimating exposure to beta and gamma radiation if they are not contaminated by radioactive particulate matter, but prevention of such contamination was impracticable for persons working in the radon emanation plant.

To evaluate radiation dosages received by the clinic personnel, special film badge monitoring of employees not working in the radon plant was conducted for two short periods during the environmental radiation study. The film badges of two employees, a radium nurse and a physician, indicated that appreciable amounts of radiation were received during daily therapy procedures. This exposure may account, in

part, for the medical findings among the radium nurses and the one physician whose employment periods were relatively brief.

### Medical Study

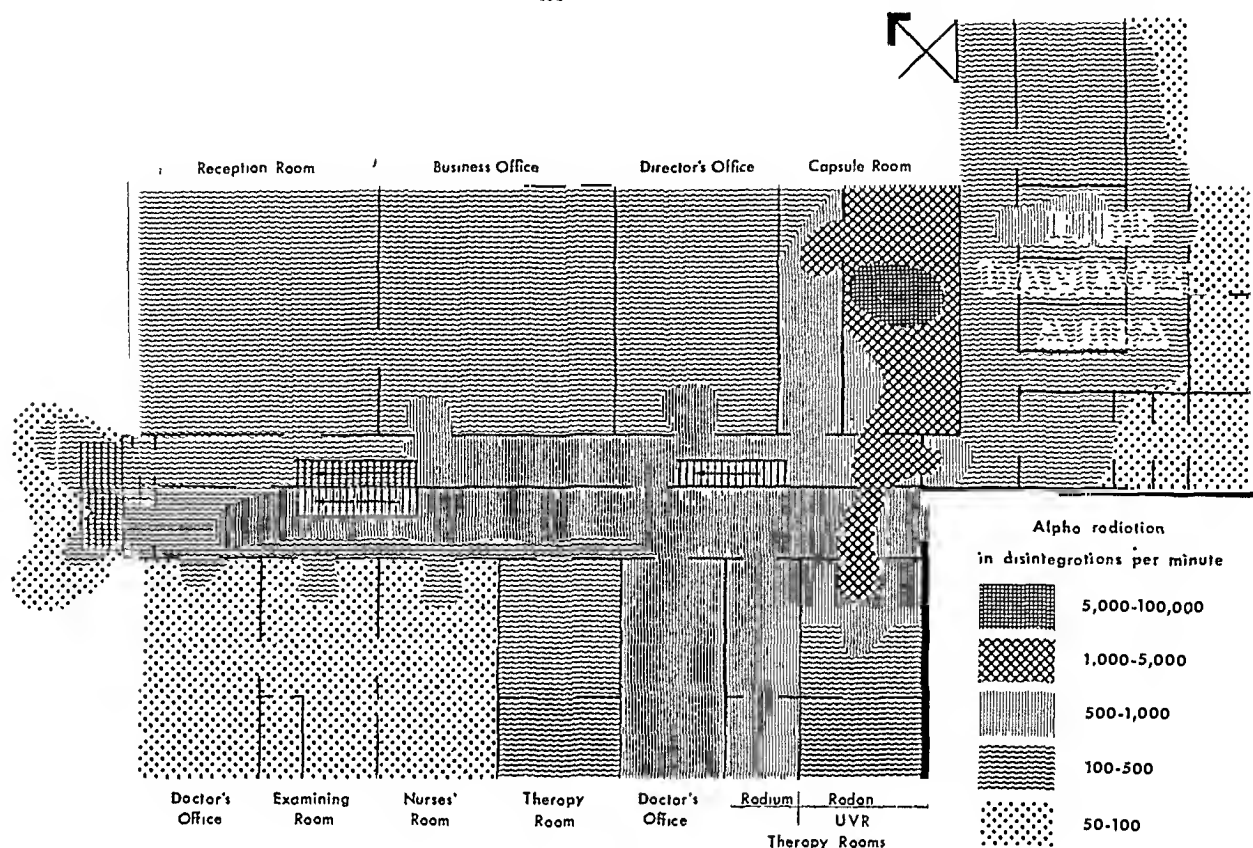
At the time of the study, 11 people were employed by the clinic full or part time. Six of these appeared voluntarily for examination upon request of the city health department and the present owner of the clinic. Four former employees of very recent date also appeared for examination on request of the clinic owner and former colleagues.

The length of employment of the 10 persons examined varied from 1 to 39 years and totaled 195 years. However, duration of employment is not necessarily synonymous with length of exposure as will be noted from the following job descriptions for clinic employees.

*Radium nurse.* Provides general care for clinic patients and assists in the administration of radiation treatment. (Generally, workers remain only 3 months of the year at this job.



Figure 2. First floor: Loose radioactive contamination as estimated from wipe samples taken from floor surfaces.



It is known that adequate protection is difficult to achieve in this type of work.)

*Nurse.* Provides general patient care but is not exposed to radiation except from material implanted in patients.

*Physician.* Plans and administers radiation treatment. (No rotation of personnel is stipulated.)

*Radon pumper.* Pumps radon off the radium after cleaning the vacuum system, requiring approximately 1 hour of work per day. (The usual rotation is 2 weeks on this duty and 6 weeks off, but periods of rotation have varied over the years.)

### Medical History of Personnel

Since 1921 periodic blood counts have been done by the clinic on many of those employees exposed to radiation. In all, 310 employees had blood counts done on one or more occasions during this time. No findings of clinical significance could be discovered from inspection of these counts, and there were too few counts

per person to warrant subjecting the figures to statistical analysis.

The supervising radiochemist had been employed for more than 35 years. Early in his career at the clinic, he did considerable radium chemical research and radon pumping. He reported that he had had a nearly fatal attack of aplastic anemia in 1920 and his blood counts have been low ever since. The others examined had a number of ailments of medical significance but not any of a nature that is likely to be confused with radiation damage except for one person in whom epidermophytosis of the hands had been treated with X-ray in 1937 and another who had had three series of nasal radon applications for "prevention of colds."

### Examinations

On the basis of previous experience, it was believed that any external radiation effects were most likely to be observed in the skin, nails, and hair (2). Routine hematological and urine examinations were performed on all those exam-



tion exposure history should be obtained and evaluated prior to allowing additional radiation work.

8. Personnel radiation monitoring should be maintained and evaluated. Whenever excessive exposure (greater than currently accepted maximum permissible limits) is detected, proper medical examination should be performed, and techniques devised to reduce exposure to permissible levels.

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*On February 13, 1954, the 2-gram supply of radium remaining at the former clinic was transported to the new location. The transfer took place without incident and was done in private vehicles. At this writing, nothing definite is known about the final disposition of the old buildings.*

*At the present time, most of the recommendations contained in this paper have been put into effect in the new building.*

#### REFERENCES

- (1) Beyer, R. T. Compiler: Foundations of nuclear physics. Facsimiles of thirteen fundamental studies as they were originally reported in the

scientific journals. New York, N. Y., Dover Publications, 1949, footnote, p. 7.

- (2) Aub, J. C., Evans, R. D., Hempelmann, L. H., and Marland, H. S.: The late effects of internally deposited radioactive materials in man. *Medicine* 31: 221-329, September 1952.
- (3) Harley, J. H., Jettcr, E., and Eisenbud, M.: A method of obtaining reproducible breath radon samples. *A. M. A. Arch. Indust. Hyg. & Occup. Med.* 4: 1, July 1951.
- (4) Williams, E. K.: The problem of hematological procedures in the control of hazards to persons occupationally exposed to ionizing radiations. Atomic Energy Research Establishment, Ministry of Supply, Med/R 831. Harwell, England, The Establishment, 1951.
- (5) Harrington, E. L.: Radium: Radon plants. In *Medical physics*, edited by O. Glasser. Chicago, the Year Book Publishers, 1951, vol. 1, p. 1193.
- (6) Curtiss, L. F.: Prevention and control of hazards in the radium dial painting industry. *J. Indust. Hyg. & Tox.* 24: 131-144, June 1942.
- (7) Saenger, E. L., Gallagher, R. G., Anthony, D. S., and Valaer, P. J.: Emergency measures and precautions in radium accidents. *J. A. M. A.* 149: 813-815, June 28, 1952.
- (8) International Association of Fire Chiefs: Radiation hazards of radioactive isotopes in fire emergencies—An introductory report. New York, N. Y., The Association, 1950.
- (9) Gallagher, R. G.: Firemen must be protected against radiation hazards. *Occup. Health* 13: 45-48, March 1953.

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## Applications for Grants in Cancer Research

Acting for the American Cancer Society, the Committee on Growth of the National Academy of Sciences-National Research Council is accepting applications for grants-in-aid for cancer research in the United States. Applications received before October 1, 1955, will be considered during the winter and grants recommended at that time become effective July 1, 1956. Investigators now receiving support will be notified regarding application for renewal.

The committee feels that an understanding of cancer depends upon a deeper insight into the nature of the growth process, normal and malignant. Therefore, the scope of the re-

search program is broad and includes, in addition to clinical investigations on cancer, fundamental studies in the fields of cellular physiology, morphogenesis, genetics, virology, biochemistry, metabolism, nutrition, cytochemistry, physics, radiobiology, chemotherapy, endocrinology, and carcinogenesis. The committee is particularly interested in encouraging research in the epidemiology of cancer.

Application blanks may be obtained from the Executive Secretary, Committee on Growth, National Research Council, 2101 Constitution Avenue NW., Washington 25, D. C.

*Emphasizing the importance of knowing the "anatomy" of our communities, a health officer illustrates with two examples how epidemiological data and techniques can be used in program planning and suggests where more information is needed.*

# Epidemiological Techniques and Data in Planning Public Health Programs

By BERWYN F. MATTISON, M.D., M.P.H.

IT WOULD seem unnecessary to stress the reasons for the importance of program planning in public health. We have heard a great deal about program planning during the past few years, and we have learned that it, as well as program analysis, is a responsibility of a health department director that he must not shirk.

In order to plan new programs, we need an occasional glimpse of the health problems that lie ahead and of the techniques now being developed that may be applied to control them. We also need estimates of the current effectiveness of existing programs, for often new programs can be added only if obsolete activities are discarded. In both instances the data and techniques of epidemiology can be used to good advantage.

As long ago as 1927, that dean of American epidemiologists, Wade Hampton Frost, who

was talking about the relating of disease frequency to population characteristics, said that we needed many "facts collected especially because of their epidemiological significance. These, which are, perhaps, the most distinctive data of epidemiology, include systematic collective observations on the incidence of different diseases in relation to such details of local environment, personal habits, past history, and individual traits as may be supposed to have a probable relation to the occurrence of the disease." This goes far beyond the usual morbidity and mortality rates according to age, sex, and race. In view of the developments during the past quarter of a century, we might translate for local environment: level of housing sanitation or fluorine content of the municipal drinking water; for personal habits: the number of packs of cigarettes smoked each week; for past history: frequency of prior accidents; and for individual traits: the state of the individual's nutrition in terms of percentage overweight or underweight. Then we have striking reminders of the acuity of Dr. Frost's statement.

Such data are the natural domain of public health. They form a basis for the determination of a particular community's peculiar anatomy. Here I should like to digress for a mo-

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*Dr. Mattison, formerly commissioner of health of the Erie County Health Department, Buffalo, N. Y., is now secretary of health, Pennsylvania Department of Health. This paper is a condensation of the Delta Omega Lecture presented by Dr. Mattison at the University of Michigan School of Public Health in May 1954.*

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ment to stress the importance of the concept of community anatomy.

Both the practicing clinician in medicine and his patients accept the ill individual as the clinician's proper field of operations. His knowledge of normal histology and anatomy and his training and experience in the pathogenesis and etiology of disease form the foundations of his value to the individual in curing or ameliorating illness. Also, it should now be firmly established that the public health physician has the additional responsibility of knowing the characteristics of the groups of individuals which make up his community and the disease patterns of the community as a whole and of its various population groups.

There is a parallelism here that cannot be ignored: Just as the private physician examines the various parts of the human body in order to understand what is going on in his individual patient, so must the public health physician examine a group of communitywide factors in order to understand disease patterns as they affect masses of people. But there is also a strict dichotomy: The kinds of information necessary to analyze and correlate community factors with disease prevalence are such that they are not readily available to the individual clinician, based as they must be on reports of disease, deaths, and births and involving, as they do, not characteristics of the individual but group patterns of these characteristics. Thus, only a community agency, such as the health department, is in a position to perform this function.

What are the factors involved in determining community anatomy? The following list, though by no means all inclusive, gives examples of the principal kinds of factors, a knowledge of which will add considerably to the understanding of community disease patterns.

#### Internal factors:

1. Age.
2. Sex.
3. Race.
4. Inherited tendencies.

#### External factors not controlled by public health programs:

5. Type of work and working environment.
6. Economic status, as reflected by housing and nutrition.

7. Climate and seasons.

8. Chronologic location on the long-term disease incidence cycle.

#### External factors controllable by public health programs:

9. Sanitation.
10. Physiological resistance to disease.
11. Isolation, quarantine, and hospitalization.
12. Health education.

Now let us turn to some illustrations of the use of epidemiological data and techniques in program planning and analysis.

### Diabetes Case Finding

During the past 5 years in Erie County, N. Y., the health department has been cooperating with the medical society and the public health laboratory in a program of diabetes case finding, using mass survey techniques. Because the collection of capillary blood samples was found to be much more acceptable to large groups of people than the collection of urine samples, fairly extensive use has been made of the Wilkerson-Heftmann blood glucose test. At first, voluntary laboratory technicians carried out the examinations, but during the past year, the clinitron has been used.

In this program, we have tried to tie in the operation of detection centers with public education on diabetes, particularly stressing the population groups that we believe most likely to have undiscovered clinical diabetes. It was decided early to direct our message toward people who are over 40 years old and overweight and who have a family history of diabetes. Also, it was decided to emphasize the danger among women in these categories.

During the first 4 years, detection centers were operated for less than 1 week each year in a few of the large department stores in downtown Buffalo and for exactly 1 week in the health building at the county fair. Since the county fair is traditionally in August, the city survey was conducted in the wintertime. During the past year, two major changes were made in the distribution of case-finding services: First, detection centers were set up in four different locations in the city at 2-month intervals. Second, the Wilkerson-Heftmann clini-

tron test was made a part of the health department chest clinic routine.

Let us now consider questions which should be asked about this kind of operation, some of which can be answered by application of epidemiological data and techniques. Does the nature of our appeal to the public and the location of the centers give us the kind of test groups we think we should be reaching? And, of course, does the yield of positive tests confirm or disprove the validity of our basic assumptions as to which groups should be reached?

Clinical verification of positive tests has not been considered in evaluating the program. It is assumed that persons with blood glucose values above the screening levels used deserved further medical consultation and that the clinical diabetes yield in these groups would be greater than in otherwise similar groups with lower blood glucose levels. Few, if any, persons with known diabetes are included in the test groups. Each person reporting for a test was asked twice whether or not he had diabetes, first by the volunteer worker who filled out the history sheet and again by a public health nurse just before the test was made. If the answer was yes, the person was either not tested or his record was excluded from the subsequent tabulations.

#### *Characteristics of 1950 and 1951 Test Groups*

As shown in table 1, between 27 and 33 percent of the population in Erie County in 1950 was 45 years of age or over, but more than 50 percent of the 1950 and 1951 diabetes test

groups were in this age group. Thus, we succeeded in testing considerably more people past the age of 45 years than were normally distributed within the community. We also tested considerably more women than men. In the age groups 15 to 44 years and over 45 years there were 3 women to every man. It might be noted that there was no significant difference in age distribution in the population between males and females.

There are certain other internal factors about which we have information for the test groups but none for the population as a whole. For instance, the data concerning history of diabetes in the family showed that 27 percent of the 1950 group and 25 percent of the 1951 group had such a history. Incidentally, over 70 percent of the known prior cases were among lineal relatives rather than collateral relatives. It would seem unlikely that 1 out of 4 people in the general population has diabetes in the family, but at present there are simply no adequate data for comparison.

Furthermore, we were interested in testing people who were overweight and particularly women who were overweight. Forty-four percent of all women in the 1950 and 1951 test groups admitted to weights of over 150 pounds, and 37 percent of those under 5 feet and 4 inches in height still admitted to weights of over 150 pounds. Here again, there are no good communitywide data for comparison, but it would seem that the test groups were really weighted in the direction in which we had hoped they would be.

**Table 1. Age distribution of population in Buffalo and Erie County, N. Y., in 1950 and of the 1950 and 1951 diabetes test groups**

Age (in years)	Buffalo		Erie County, exclusive of Buffalo		Diabetes test groups			
					Males		Females	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
All ages.....	583, 132	100. 0	319, 106	100. 0	1, 960	100. 0	5, 802	100. 0
Under 15.....	129, 299	22. 2	88, 901	27. 9	106	5. 4	133	2. 3
15-44.....	265, 203	45. 5	142, 467	44. 6	858	43. 8	2, 496	43. 0
45 and over.....	188, 630	32. 3	87, 738	27. 5	985	50. 2	3, 155	54. 4
Unknown.....					11	. 6	18	. 3

**Table 2. Yield of positive tests in 1950<sup>1</sup> and 1951,<sup>2</sup> according to age**

Age (in years)	Number tested		Number positive		Percent positive	
	1950	1951	1950	1951	1950	1951
All ages.....	3, 959	3, 803	618	54	15. 6	1. 4
Under 15.....	152	87	9	0	5. 9	0
15-44.....	1, 612	1, 742	170	13	10. 5	. 7
45 and over.....	2, 168	1, 972	436	41	20. 1	2. 1
Unknown.....	27	2	3	0	11. 1	0

<sup>1</sup> Screening level of 130 mg. percent after eating.

<sup>2</sup> Screening level of 180 mg. percent after eating.

### *Yield of Positive Tests in 1950 and 1951*

As shown in table 2, there was indeed a tremendous difference in percentage of positive tests between the younger age groups and the age group 45 years and over. Even among the young adults, those aged 15 to 44 years, the yield of positive tests was only about half the yield among the oldest group. This was true for the 1951 group, for whom the blood-sugar screening level of 180 mg. percent was used, as well as for the 1950 group, for whom the very low screening level of 130 mg. percent was used.

From table 3, we see that there was, as expected, a considerably higher yield of positive tests among overweight people, if we accept two broad weight groups—over 150 pounds and under 150 pounds. The yield in the group over 150 pounds was from 30 to 55 percent greater than the yield in the group under 150 pounds.

With respect to the yields according to sex

**Table 3. Yield of positive tests in 1950<sup>1</sup> and 1951,<sup>2</sup> according to weight**

Weight (in pounds)	Number tested		Number positive		Percent positive	
	1950	1951	1950	1951	1950	1951
All persons.....	3, 959	3, 803	618	54	15. 6	1. 4
Under 150.....	1, 894	1, 797	257	20	13. 6	1. 1
150 and over.....	2, 034	1, 985	355	34	17. 5	1. 7
Unknown.....	31	21	6	0	19. 4	0

<sup>1</sup> Screening level of 130 mg. percent after eating.

<sup>2</sup> Screening level of 180 mg. percent after eating.

and history of diabetes in the family, however, the data did not confirm our original hypotheses. For 1950, when the lower screening level was used, 15.4 percent of the males and 15.7 percent of the females had positive tests—not a significant difference. For 1951, when the higher screening level was used, there was still no real difference in yields according to sex—1.5 percent positives among males and 1.4 percent positives among females.

As shown in table 4, neither in 1950 nor in 1951 did we observe any excessive yields associated with prior diabetes among relatives. This finding cannot be fully explained, but it may be that cases in which heredity is a factor are discovered early in life and would therefore

**Table 4. Yield of positive tests in 1950<sup>1</sup> and 1951,<sup>2</sup> according to history of familial diabetes**

History	Number tested		Number positive		Percent positive	
	1950	1951	1950	1951	1950	1951
All persons.....	3, 959	3, 803	618	54	15. 6	1. 4
Without history of familial diabetes.....	2, 884	2, 844	452	39	15. 7	1. 4
With history of familial diabetes.....	1, 051	952	163	15	15. 5	1. 6
Unknown.....	24	7	3	0	12. 5	0

<sup>1</sup> Screening level of 130 mg. percent after eating.

<sup>2</sup> Screening level of 180 mg. percent after eating.

not be reflected in these test groups, which are made up largely of older adults.

### *A Group Tested in 1954*

Finally, let us consider a group tested for diabetes during the first quarter of 1954 as part of the routine of the health department chest clinic. Table 5 shows some of the characteristics of this group. The numbers of males and females were practically equal. It is still predominantly a group of older persons, but only 52 percent were over 40 years of age whereas this percentage were over 45 years in the 1950 and 1951 groups. Again, we did not find an excess of positive tests among females; in fact, we found the percentage higher among males.

**Table 5. Yield of positive tests among chest clinic patients, according to age, first quarter of 1954<sup>1</sup>**

Age (in years)	Number tested		Number positive		Percent positive	
	Males	Fe-males	Males	Fe-males	Males	Fe-males
All ages.....	1, 503	1, 423	46	21	3. 1	1. 5 <sup>1</sup>
Under 40.....	695	713	10	1	1. 4	. 1
40 and over....	808	710	36	20	4. 45	2. 8

<sup>1</sup> Screening level of 160 mg. percent after eating.

Because the screening level was again changed, this time to 160 mg. percent of glucose, direct comparisons between this group and the earlier ones is impossible, but it is interesting to note the continuing preponderance of yield in the older age group.

To recapitulate, we see how such factors as age, sex, body weight, and heredity can be considered in both the planning of a diabetes case-finding program and later in an analysis of the extent to which those plans have been carried out. The ultimate evaluation of the program must, of course, take into account clinical confirmation of cases referred on the basis of positive blood tests as well as the prevention of disability and death resulting from the early discovery of cases.

### Housing and Health

One hundred and four years ago, Lemuel Shattuck, in his Report of the Sanitary Commission of Massachusetts, said, "The condition of dwelling houses has a most intimate and important relation to the health of the inmates." Since that time there has been general acceptance of this dictum, and many statements have been made sympathetic to the theory that better housing might produce better health. But the quantitative relating of housing to health is difficult and has been attempted infrequently. Obviously, the problem is a complicated one, with the whole picture of depressed economic status, rather than just the condition of housing, having an important bearing on health.

In approaching this problem, we must first try to find out whether the life expectancy for

people living in areas of crowding, poor sanitation, and lack of recreational facilities actually differs from that for people living in more fortunate circumstances and, if it does, just what the difference amounts to in a specific situation. Then, as one step in attempting to sort out the impact of crowding and improper sanitation in contrast to inadequate provision of medical care, we might try to determine the causes of excess mortality and see whether there is a preponderance among those diseases characterized as infective and parasitic. We might expect such a preponderance if crowding and improper sanitation are major factors in decreased life expectancy, since upper respiratory infections or hand-to-mouth and vector-transmitted infections are most likely to occur under these conditions. We might also get a rough check on some of the related factors by making nutrition surveys on a sampling basis in areas with varying economic status. Such surveys might indicate whether or not nutritional inadequacies are contributing to the morbidity and mortality pattern.

During the past year, we have attempted to do various of these things in the city of Buffalo. First, all the census tracts were grouped into three economic categories: above average, average, and below average. United States Bureau of the Census data on housing for 1950 were used, and three characteristics were considered—density of population, adequacy of water supply, and presence or absence of toilet facilities. Then, life tables were prepared for the population in each of those three groups of

**Table 6. Life expectancy at birth, according to socioeconomic areas, Buffalo, 1950**

Socioeconomic areas <sup>1</sup>	Life expectancy (in years)		
	All persons	Males	Fe-males
Above average.....	68. 5	67. 0	69. 9
Average.....	66. 9	64. 8	68. 9
Below average.....	61. 8	59. 9	64. 5

<sup>1</sup> Census tracts grouped according to density of population, adequacy of water supply, and toilet facilities, from United States Bureau of the Census data on housing.

have no generally acceptable index of change in people's attitudes that would enable us to measure the effectiveness of different techniques.

In conclusion, may I urge that we accept and utilize the concept of community anatomy. To do this effectively, we must develop adequate

epidemiological data, in the broadest sense of the term, to describe our communities, their people, their health problems, and their health protective resources. In this way, we can help our community improve the health and happiness of its people.

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## Poliomyelitis Vaccine Advisory Committees

Appointments were made in May 1955 to three key advisory groups to aid the Department of Health, Education, and Welfare and the Public Health Service in the formulation of policies concerning safeguards for the production, continued research, and the distribution of Salk poliomyelitis vaccine.

Named to the permanent advisory group, called the Technical Committee on Poliomyelitis Vaccine, are the following: David Bodian, poliomyelitis laboratory, Johns Hopkins University School of Hygiene and Public Health; Thomas F. Francis, Jr., School of Public Health, University of Michigan; Jonas E. Salk, virus research laboratory, University of Pittsburgh; Richard E. Shope, Rockefeller Institute for Medical Research; Joseph E. Smadel, department of virus and rickettsial diseases of the Army Medical Services Graduate School; John F. Enders, department of bacteriology and immunology, Harvard University Medical School; William McD. Hammon, department of epidemiology and microbiology, University of Pittsburgh Graduate School of Public Health:

Arthur C. Hollister, Jr., bureau of acute communicable diseases, California State Department of Public Health; Robert F. Korns, poliomyelitis vaccine evaluation center, University of Michigan, and bureau of epidemiology and communicable disease control, New York State Department of Health; Edward H. Lennette, viral and rickettsial disease laboratory, California State Department of Public Health:

G. Foard McGinnes, National Foundation for Infantile Paralysis; John R. Paul, Yale University Medical School; Albert B. Sabin, Children's Hospital Research Foundation, University of Cincinnati College of Medicine; Howard J. Shaughnessy, Illinois Department of Public Health; and Herdis von Magnus, State Serum Institute, Denmark.

Surgeon General Leonard A. Scheele named Bodian, Francis, Salk, Shope, and Smadel to a Standing Expert Committee. James A. Shannon, associate director of the National Institutes of Health, Public Health Service, was named chairman of this group.

Health, Education, and Welfare Secretary Oveta Culp Hobby named the following to serve on the National Advisory Committee on Poliomyelitis Vaccine:

Chester S. Keefer, committee chairman, and special assistant (for health and medical affairs) to the Secretary of Health, Education, and Welfare; Philip S. Barba, American Academy of Pediatrics; Daniel Bergsma, New Jersey State commissioner of health; Robert Fischelis, American Pharmaceutical Association; Malcolm Phelps, American Academy of General Practice; Julian P. Price, American Medical Association; George M. Uhl, Los Angeles city health officer;

Basil O'Connor, National Foundation for Infantile Paralysis; Mrs. Newton P. Leonard, National Congress of Parents and Teachers; Mrs. Charles L. Williams, National Congress of Colored Parents and Teachers; and Frank W. Moudry, National Association of Retail Druggists.

# AIR POLLUTION CONTROL

## A NEW FRONTIER

Twenty papers are presented in brief from the First International Congress on Air Pollution, March 1-2, 1955, New York City. Attended by scientists and engineers from seven countries, the congress was organized by the American Society of Mechanical Engineers in observance of its 75th anniversary. It is the outgrowth of early and continuous air pollution research by ASME, which published a model smoke law widely used as the basis of most municipal ordinances aimed at air pollution control in the United States.



# Biological Effects

PHR

One reason why air pollution has been the subject of so much rumor is the lack of precise understanding of what ills result from the contaminants in the air around us.

Beyond question in several well-publicized disasters, serious illness and death resulted from polluted air. Yet in ordinary industrial cities the life span and general state of health continue to improve.

We have every reason to suspect that in the middle ground between these two extremes some health impairment must be resulting, but of an extent unknown.

In some cases, the needed information is not so much new biological research as a better description of the environment. In most instances, however, our information on the biological effects of air pollutants is meager or nonexistent.

Before we can estimate the magnitude of the problem, we must define the nature of the biological effects in which we are interested. These could be listed as systemic diseases, skin, eye, and respiratory irritation, and lung cancer.

## Skin and Eye Irritation

With some reservations, we can say that our major attention should be directed to the biological effects of air pollutants acting on the body surfaces, for systemic poisoning arising from air pollutants appears to be rare. Nevertheless we should be alerted to the possible difficulties arising from carbon monoxide and lead, which are normal byproducts of the use of anti-knock gasoline.

To continue with our listing, skin irritation no doubt occurs in unusual situations. However, the skin is not readily troubled by the mild level of irritants ordinarily found in the

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*By Norton Nelson, Ph.D., director, Institute of Industrial Medicine, New York University-Bellevue Medical Center, New York.*

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air of even heavily contaminated areas. Very possibly some specific allergic skin sensitivities can be developed from air contaminants.

Eye irritation is one of the most prevalent of the biological effects attributed to air pollutants and one about which it may be possible to achieve a moderately objective judgment as to its presence or absence.

Although a substantial amount of investigative work has been done on eye irritation, we have neither a reliable estimate of the variability of susceptibilities to irritants in different individuals, nor a well-authenticated table of comparative irritancy of various substances.

Filling in these two gaps would help systematize our understanding of the importance of eye irritation and aid in setting standards for control. Eye irritation possibly could be used as an indicator for generally assessing the irritancy of materials. Such a scale might aid in predicting irritancy for tissues where measurement is more difficult.

As the eye is more sensitive to corrosive and irritant materials than the skin, so are the pulmonary tissues more sensitive than the eye. Hence, the effects of irritating materials on the respiratory tract are perhaps the most significant biological effects of airborne contaminants.

## Respiratory Irritation

Most of the deaths and the many instances of illness occurring in the Meuse Valley in 1930, at Donora in 1948, and at London in 1952 stemmed from respiratory involvement. Except possibly for Donora, the nonfatal events remain unknown in extent. Deaths that occur in such episodes are perhaps chiefly those that are in some degree imminent in that those stricken are elderly, ill, or are otherwise poised precariously. During the London smog, sulfur dioxide concentration rose to a peak of 1.34 p.p.m. This level is, however, much below the concentration of 10 p.p.m. considered tolerable for industrial work places.

To understand better how such deaths may arise, let us discuss the effects of irritants on the pulmonary tract.

The lining of the upper part of the tract, the nasal passages, and the conducting airways are perhaps less sensitive than the alveoli. Cer-

tainly, damage to these delicate tissues is more serious than is irritation of the upper tract. When the chief reaction occurs in the upper tract, there will be coughing, sneezing, and a sense of nose or throat irritation. When the reaction occurs in the alveoli, a series of changes set in which may have far-reaching consequences.

The functional state of the lungs depends on a finely balanced interplay of factors which contrive to maintain efficient performance with a substantial margin of safety in the healthy individual.

In a person with pre-existing lung or circulatory disease, this usual safety factor has disappeared. The congestion and increased permeability of the capillary walls arising from the irritant effect of inhaled material can lead to progressive fluid accumulation. This interferes with oxygen uptake, which then adds its part to the vicious circle, since oxygen lack favors increased fluid effusion. These changes further impede ready circulation through the lungs.

Although inhaled irritants will influence both upper and lower respiratory tissues, certain factors tend to determine the major locus of uptake and accordingly control the nature and severity of symptoms. Thus gases of high water solubility are largely absorbed in the upper tract. Conversely, low solubility leads to deep penetration with generally graver consequences. Also, transportation of irritants on small particles of 1 micron or less probably favors deep penetration.

Can we infer from our findings in Donora and London a direct and systematic relationship leading to real but lower levels of difficulty at lesser intensities of irritants? An analysis of the incidence of deaths from bronchitis in various parts of Britain shows a definite correlation between the death rate from this disease and the average sulfur dioxide concentration. But it would be hasty to conclude that a cause and effect relationship has been established.

We cannot simply extrapolate downward from such experience to an estimate of the incidence of illness caused by air pollutants as found in our larger cities so long as we are lacking in assurance as to the relative impor-

tance of the various irritants, as well as a systematic understanding of the relationship of level to effect, and, especially, in complete comprehension of the pattern of changes that occur and how they are modified by already present disorders.

### Sulfur Dioxide

The classical methods of animal toxicology are generally inefficient for the demonstration of functional impairment. These methods have real limitations in detecting the effect of very low levels of materials which simply modify the balance of physiological events without producing overt tissue damage.

Andur and Drinker have found that sulfur dioxide and sulfuric acid taken by human subjects at subsensory concentrations produced increased pulse and respiratory rate and decreased tidal volume and that these effects were involuntary physiological responses.

More extensive research work of this type would help us understand the physiological malfunction resulting from the inhalation of irritants, the physiological events leading to these observed changes in pattern, and how response is altered in elderly or diseased individuals.

We are still confronted with the epidemiological problem of measuring the frequency of occurrence of pulmonary and cardiac disorders attributable to air contaminants. An important distinction can be made here between the measurement of mortality and the measurement of morbidity. There is no uncertainty about the presence or absence of death, but there is about the presence or absence of disease when the concern is with a vague group of disorders which are present whether we have air pollutants or not.

Some systematic measurement of the frequency of occurrence of nonfatal respiratory difficulties was obtained at Donora and from the British experience also. However, we lack authoritative information on the contribution of air pollutants to respiratory disorders for the ordinary situation. Perhaps the most useful attack would be in the direction of devising simpler procedures to obtain this information.

Other than sulfur dioxide, what are the sig-

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air of even heavily contaminated areas. Very possibly some specific allergic skin sensitivities can be developed from air contaminants.

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quickly died down, but from time to time the matter was revived, and pressure continued steadily.

The committee of inquiry, over which I presided, was appointed in July 1953. We thought that it was desirable to issue an interim report, in order that the final report should not be cluttered with descriptive material which would distract attention from our findings and recommendations. The interim report appeared early in November and was received with a howl of derision by most of the popular press.

So much the better. Anything was better than absence of interest.

### **The Final Report**

We published our final report in November 1954, at the beginning of our serious fog season. It was received with the most remarkable chorus of approval and a general call for action. The atmosphere of public opinion was at the moment peculiarly suitable and receptive for the right kind of report.

We particularly aimed at being clear and emphatic in the expression of our views and in the definition of our recommendations. We wrote so that the general newspaper reader could easily understand what was proposed and why. We certainly had enough material to produce a detailed, scientific study, and indeed we had to consider and weigh this vast volume of material, but we finally produced our conclusions in some 12,000 words.

For those who do not know England, Scotland, and Wales, I must explain that most of the population lives in an area about 60,000 miles square, not more than 100 miles wide—say about the area of Michigan and 8 times its population. There are in this area some 14 million houses, nearly all with open fireplaces and some hundred thousand factory chimneys. If one included all the small furnaces, which between them may consume some 10 to 15 million tons of fuel a year, the total number of chimneys would be at least twice as great and possibly more. Add that pollution from factory chimneys and domestic grates has been measured 60 and more miles from its source, and you have some idea of the problem in one single permanently polluted area.

My committee estimated that more than half the population lived in highly industrialized and heavily populated areas that were by geographic situation subject to frequent and persistent natural fog throughout the autumn months and consequently subject to frequent concentrated severe smog. We called these the "black areas," and we decided that attention must be first directed to these plague spots.

These conditions are so different from those in the United States that it may not be easy to realize how such a position both required and permitted that the problem be treated as a whole, and as a national problem. We had no doubt that this was so, though leaving generally with the local authorities the responsibility for enforcing the great part of the legislation.

We took no formal evidence. We started with the premise that all persons were agreed as to the objective, namely, the cure of air pollution, and that the only questions for discussion, therefore, were the practicability and the means. We invited all interests to a round-table discussion, and we broke up our committee into a number of small subcommittees to carry on the subsequent discussions quite informally. We believed, and the event confirmed the belief, that circumstances justified such an approach.

We started our report with a clear statement of the two counts against air pollution—health and cost. We expressly avoided basing our arguments on the danger to health of particular incidents, such as the London smog. We felt that undue emphasis on it would distract attention from the sad bill of unhappiness and ill health and earlier death that the whole country was paying. And then we gave our considered estimate of the economic cost to the nation.

Over and above the burden of ill health, the country was spending each year something like \$15 per head of the population, as we believe, a conservative estimate. It was against this background that we then proceeded to make our recommendations.

### **Proposals for Action**

First, we proposed that all previous legislation, national and local, should be swept up into a new all-embracing act applicable to the whole

country. We proposed that this should be called the clean air act, a simple but brilliant and pregnant suggestion.

We proposed that legislation regarding industry should be nationwide and that there should be no question of pushing or removing potential industrial nuisances out of one local boundary into another. This is, of course, a much easier line to take in our small and more or less homogeneous country than it would be in the United States, but the differing attitudes and fears and jealousies of neighboring local authorities, of which there are over 1,000, had in the past seriously militated against action in regard to serious and avoidable nuisances.

We proposed to prohibit dark smoke from all ordinary furnaces and that it should no longer be necessary to prove nuisance.

We proposed that there should be no "protected" or sheltered industries or processes, that all without exception should be subject to challenge by really qualified national inspectors.

We proposed to create a simple way of establishing smokeless zones, instead of each local authority having to secure parliamentary power for itself.

We invented a new type of semismokeless zone in which smoke was to be reduced by 80 percent and which could therefore include industrial areas not fitting into any smokeless zone.

We proposed that part of the costs that would fall on individuals and businesses should properly be defrayed from the national purse.

We proposed that every local authority would have to publish annually an account of its activities in the past year in dealing with air pollution.

Finally, we proposed that there should be a clean air council to watch, encourage, coordinate all activities, and to report annually to Parliament.

I cannot say what action will eventuate. But I can say that I do not believe recommendations of this nature would have had the slightest chance of being accepted either by government or by industry or by the ordinary householder or by the public press. 20 years ago, perhaps even 5.

Now, the odds are, I believe, quite strong that action will follow. I think so because it seems

to me quite evident that this is now the public wish, because at last there has been that growth of public opinion on which everything in the end rests.

## Administrative Patterns

PHR So far as is known, New York State is the only State to make any organized effort to assess "grass roots" problem areas and combine the findings in an integrated picture of the problems in air pollution control. Extrapolation of the data collected in New York State would indicate that at least 10,000 communities in the United States have a local air pollution problem.

Large areas of the United States are without effective governmental regulation of air pollution. It is of real interest, therefore, to examine the needs of various areas for such regulation and the form that it should take. We tend to think that all we must do is check the map for large population and industrial centers. But we overlook a wide variety of problems. Thus, in what might be termed wasteland uninhabited by humans, a need for control arises if the flora and fauna of the area are being adversely affected to the extent that a natural resource is being abridged. At the other end of the scale, a need for control arises as soon as the finish on a single parked car is damaged by the effluent from a nearby stack.

The 1954 New York State survey definitely points to the need for State level legislation and organization for air pollution control.

In that study, town, village, city, and county clerks were questioned as to their personal

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knowledge of the severity of the local air pollution problem and the nature and location of the principal sources of contamination. Particular note was made of the limits of legal jurisdiction of the affected community and the interest of the local government in the problem. In addition, information as to applicable local ordinances and enforcement organization was obtained.

Although the sample of communities reporting is only 34 percent (530) of a total of 1,555, it includes 88 percent of all communities of over 3,000 population in New York State.

### Analysis of the Findings

Since air pollution problems frequently crop up in rural communities where they are least expected to occur, they can best be uncovered by persons having close familiarity with the scene. However, it was obvious that the use of one local official's response to categorize a community lacks objectivity. Statement by a respondent that specific air pollution sources exist were accepted as true even though the sources may not have been causing trouble at the time of the investigator's visit to the community.

It was characteristic of the study that in small communities, officials thought of the problem in terms of a few specific offenders, whereas in larger ones they thought in terms of processes causing pollution, such as incineration. Obviously, a major nuisance in a small community is deemed a minor one in a city of several thousand blocks.

The survey revealed the following:

Four hundred fifty-five communities in the State of New York are recognized as having local air pollution problems.

About half the urban and a third of the rural communities have problems they think need correction.

As expected, air pollution is of significance in a greater percentage of urban than of rural communities, but it also exists to a significant extent in even the smallest of the rural communities.

Seventeen percent of the urban and 20 percent of the rural jurisdictions report one or more important air pollution sources outside their jurisdiction.

There are no local air pollution or smoke control ordinances in 55 percent of the urban communities and 83 percent of the rural communities which have air pollution problems.

Personnel are employed full time to cope with air pollution problems in only 8 of the 455 communities.

Estimates of part-time responsibility of personnel are rather meaningless since every community has some individual or agency to receive and hear citizens' complaints of all types, regardless of their ability to act effectively. Therefore, it may be assumed that in 447 communities having an air pollution problem effective local attention is available only in those instances where there are sanitary engineers in the municipal or county health department. There are about a dozen such jurisdictions in the State; 4 are in county health departments and thus embrace a number of communities.

### State and Regional Control

New York has two State departments, health and labor, to which local agencies can turn for assistance in solving air pollution problems, but a number of other States have no State agencies with personnel trained and available for such matters.

Over the past two decades there has been an expansion of the concept of the air pollution control area. During this period a number of county control organizations have been created, some including or excluding the city forming the heart of the county.

In the San Francisco Bay area, counties are presently authorized to declare themselves individually to be countywide air pollution control districts. Some now feel that, in a region where populous counties are contiguous, the county is too small an administrative unit. They are exploring the development of multicounty or regional administrative units as best fitting the needs of metropolitan areas.

Exploration of the regional concept reveals several major metropolitan areas embracing more than one State and indicating a possible need for interstate compacts for their legal creation and implementation. Fortunately, similar situations requiring interstate compacts have been solved in the water supply, water

country. We proposed that this should be called the clean air act, a simple but brilliant and pregnant suggestion.

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cessive cost and under conditions which do not suspend or interfere with operations for any protracted period.

The most important approach toward solving the problem is that which involves the recovery of a byproduct which is salable or can be returned to the manufacturing process. This has been demonstrated many times in steel production, as in the recovery of material from a blast furnace and the recovery of sulfur and of noble metals from smelter waste gases. Recovery of this kind has not been done without a long-range consideration of the initial cost of the equipment. Amortizing this cost against the recovery of the material has made the application reasonable, but a definite time factor and capital expenditure are involved.

Unfortunately not all economic aspects of air pollution control on which needed development is desired can be handled as simply. Many waste gases contain materials of insignificant value in offsetting the cost of control equipment. The burden of this assessment can be called the price of good community relations. Much equipment is installed on this basis to the credit of industry. When its cost becomes so disproportionate in relation to the cost of the operation that it cannot be amortized or justified on a basis of buying time in the community then we must seek less expensive methods for control of the contaminant. This emphasizes the need for less costly air-cleaning devices from both the capitalization and operating aspects.

We are fast approaching the time when atmospheric dilution and dispersion of contaminants no longer can be done when communities lie close to facilities. Few locations are now available for heavy industry where ideal transportation, raw material, power, and other economic factors justify moving a plant into an undeveloped area where the community does not encroach rapidly. There is a limit as to the height and cost of a stack, which must be balanced against the cost of the air-cleaning equipment.

### **Education Needed**

Education can push the frontier of engineering control methods farther ahead. A signifi-

cant body of literature on aerosol technology can now be presented to young engineers and chemists who will encounter in their future careers the problems of contaminants dispersed in gases.

Problems of air and gas cleaning should be a part of the curriculum of graduate mechanical and chemical engineering courses in more institutions than at present. Engineers at college level should be provided with basic information on techniques of air pollution control and performance of equipment. The engineer in training should be made aware of the differences in aerosol-collection mechanisms and their relation to particle technology.

We need some education of design and sales engineers now working in the air-cleaning and gas-cleaning equipment field in order that misapplications are avoided.

We need education of engineering and development personnel working in process design departments of many industries on aerosol technology.

We need education of individuals in regard to appraisal and evaluation of air pollution problems.

We need education of citizens as to what constitutes an air pollution problem and the degree of control which can be obtained within economic reason.

### **Fundamental Research**

Fundamental research in air pollution control by engineering methods is largely a problem of application of theory and empirical data already developed. A considerable amount of knowledge in fine particle technology has already been developed, however, and many fundamental filtration and other separation methods have been well defined.

More work is desired to yield data on new aerosols and their inherent properties. Particularly is this true of fundamental particle dynamics, electrostatic charge, and wetting. Removal of particles by aggregation, flocculation, and agglomeration remains a void, at least as to practical application in recovery of aerosols.

Unfortunately, research knowledge is not in the hands of imaginative engineers who can



apply it to practice. A restraining force is the fact that a fair amount of inertia exists in the air-cleaning and gas-cleaning industry, just as in other industries. A company which produces equipment to handle certain process effluents on a large scale may be reluctant to make major design changes without extended pilot plant experience.

Application of bag filters to air streams containing both particulates and corrosive gases is a good example of how control equipment is sometimes put to work before a thorough evaluation is made of the nature of the contaminant. Although the particulate might be removed effectively, the gas damages the fabric media in a short time. Immediately, an intensive search is made for a fabric to withstand the gas and still permit the particulate to be removed satisfactorily. Just how to remedy this condition rapidly is a difficult problem, although there has been already a tremendous advance in fiber technology.

Applied laboratory research on effective simulation of the actual problem based on reliable field evaluation may often prevent this kind of situation. On the other hand, the time factor is often ignored, and fatiguing of materials will develop in practice. This, therefore, involves able research forecasting to anticipate possible ramifications which may develop in operation.

### Technical Aspects

Technical areas still needing further investigation include:

New methods for handling fine metallurgical-process fumes at high temperatures.

Methods for controlling acid mists and complex high vapor-pressure organic suspensoids.

New methods for recovering chemical effluents which are difficult to adsorb or remove by contact washing.

New devices for combustion of low levels of gases which create odor problems and yet are too concentrated to adsorb on odor canisters but not concentrated enough for a major recovery system.

Continued studies on fundamental particle dynamics as applied to inertial separation,

filtration, and electrostatic properties of particulates.

Continued investigations of the photochemical stability and physical chemistry of aerosols.

Fundamental studies on fixed and dynamic filters with particular reference to life studies with a wide variety of aerosols.

Further studies on graded filter media for low loadings of air contaminants.

Development of temperature-resistant fabrics able to withstand 500° to 1,000° F. and still perform effectively as filter media.

Development of relationships from particle and equipment parameters which will enable the reliable prediction of performance from primary dimensions and rapidly evaluated properties of the particulate material.

## Meteorological Problems

**P-H-R** To many people, air pollution brings to mind products of combustion and of industrial processes which are released into the air. These products may be referred to as artificial air pollutants. A listing would include industrial gases, fumes, and particulates; exhausts from cars, buses, trucks, locomotives, and aircraft; products from incinerators, both private and public; and radioactive debris from atom and hydrogen bomb testing.

Natural contaminants are substances which would be in the atmosphere even without man's activities. Examples are volcanic gases and dust; salt particles from the oceans; pollens, spores, rusts, and smuts; small insects in various stages of development; sand raised in sand storms; forest and brush fire smoke; and bacteria and viruses.

Natural air pollution also may be augmented

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*By E. Wendell Hewson, professor of meteorology, department of civil engineering, University of Michigan, Ann Arbor.*

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artificially by man's activities. Land-use practices may promote the carrying of soil particles and airborne pollens into the atmosphere. Many forest fires are started as a result of carelessness.

Applied meteorology has a substantial contribution to make in the campaign for clean air. The nature of the meteorological problem depends on whether dispersal near the source or at great distances is of primary concern.

Wind direction, wind speed, and wind turbulence are the three meteorological variables governing the behavior of a contaminant near its source. When dispersal near the source is being studied, the variables may be taken as approximately constant during the travel of the contaminant from its source to a specified point downwind.

Wind direction specifies the general area into which a pollutant will move. Other things being equal, the concentration downwind from a source varies inversely with the wind speed. The degree of turbulence of the wind determines the rate of diffusion. In addition, small-scale turbulence may promote coagulation of particles in a plume. The vertical temperature gradient influences the turbulence field but has no basic significance.

The meteorological problem becomes much more complex when dispersal far downwind is to be assessed. Thus, diurnal and other variations of meteorological variables must be considered along with wind direction, wind speed, and wind turbulence.

The plume may be subject to additional influences, such as slight diffusion at night followed by great diffusion by day or vice versa; deformation and attenuation by large-scale variations of wind speed, direction, and turbulence with height; major convection currents in an unstable air mass; and large-scale uplift or subsidence in pressure systems or near frontal surfaces.

Washout of gases and particulates by precipitation falling through the plume may also be a factor in dispersal. Photochemical changes in contaminants by solar radiation may increase their toxicity, as the studies of Los Angeles smog strongly suggest. Features of the terrain influence dispersal. In valleys, for example,

the meteorological analysis is much more complex than over level country.

### Single Source Pollution

Advances in our understanding of pollution near a single source have been made, but much more must be learned about this complex subject before it can be asserted with confidence that the meteorology of air pollution control has reached a satisfactory state of development.

Future research in this field may develop through the individual or the integrated approach. It is necessary and proper in the early stages when the outlines of the problem are still indistinct and ill-defined to take one or more small segments of the problem for investigation. However, our knowledge of the meteorological aspects of the air pollution control problem near a single source is now sufficient to warrant a more integrated approach.

I propose that a research unit be established for the purpose of attacking the various unsolved problems in this area on an integrated basis. We need more studies of the variations in diffusion with the stability of the air, with the nature of the terrain, the nearness of the source of pollution to buildings, the height of the source, and the differences in time intervals used for sampling periods.

Adequate funds, facilities, and personnel would be needed for these coordinated studies, and the main outlines of the research would be delineated by a planning committee of the most competent scientists in the areas of theory, instrumentation, and analysis.

It is admittedly difficult to carry out satisfactorily such a large-scale research undertaking, but the rewards in increased knowledge are great, and the difficulties can be surmounted. With such a project, it would be possible to evaluate most of the unknowns and thus to place the meteorological aspects on a satisfactory design basis.

### Dispersal Far From the Source

Dispersal far from the source may be influenced by the meteorology of the entire troposphere, which in middle latitudes extends up to 6 miles on the average.

The rapid increase of industrialization throughout the world, and especially in the United States, suggests that a knowledge of diffusion over great distances will be increasingly important. New methods must be devised for measuring the meteorological quantities needed to specify this large-scale diffusion.

Very little is yet known about the influence of diurnal variations on dispersion. Present theory neglects the variations of wind speed and direction with height, which is a permissible simplification near the source. Dispersal by convection currents should be the subject of a full investigation. In particular, instrumentation is needed for rapid and precise measurements of the structure and diffusion action of large eddies.

Since so little is known about dispersal over great distances, I recommend that several studies by different research groups be undertaken, in order that the limits of the problem may be more closely defined.

#### Pollution From a Multiple Source

Although a number of studies of city pollution have been made, these have not produced precise information on meteorological influences. Little is known about the concentration of contaminants at large distances from a multiple source. Here again, I recommend several investigations by different research groups, using a variety of techniques and instruments developed for the purpose.

The Los Angeles studies may yield much new information on the meteorology of multiple source pollution and on the role of solar radiation in producing photochemical changes of contaminants. The pollution survey of Leicester, England, is an outstanding example of a general investigation, but comprehensive investigations are needed to verify or modify the tentative statement of large-scale dispersal formulated by that study.

Detailed studies are required in which representative values of turbulence, lapse rate, and associated concentration as well as wind speed and direction are measured both in the city and at various distances downwind. Investigations for several cities would be desirable, starting with one in flat, open terrain, and then studying

in succession several others in different terrain and under different climatic regimes.

The ultimate object is the development of a climatic classification based on the diffusing capabilities of the atmosphere. City planning commissions would then be in a position to specify tolerable limits of contaminant emission for any area and season.

With industrialization growing, the rate of accumulation of industrial contaminants, both gases and small particles, in the atmosphere should be studied on a continuing basis. It is not clear how an increasing accumulation of gases and particulates in the atmosphere might affect human life and activities, but the question is of sufficient importance to warrant much more research.

## Health Implications

**PHR.** Perhaps it would be sound to recognize that the London episode of December 1952, as contrasted with the other now famous air pollution disasters, represents a distinct type of pollution situation which we may call "typically urban."

In our opinion, the problem presented by a number of major cities is this relatively featureless type of pollution. Of course, it is known that the oxides of sulfur and the particulate products of the combustion of coal and other fuels contributed substantially to the load of atmospheric pollutants in London, but at the same time sulfur dioxide and the particulates of themselves in the concentrations found do not seem to account completely for the effects observed.

Probably there are more instances of typically urban situations than there are of the special

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*By E. A. Watkinson, M.D., D.P.H., chief, occupational health division, Canadian Department of National Health and Welfare, Ottawa, and member, Canadian Section, Technical Advisory Board on Air Pollution, International Joint Commission.*

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types. If this is true, it follows that many more people are exposed to these typically urban atmospheres.

It is helpful to recognize that the irritant or toxic actions of air pollutants may be classified on an intensity scale which is related to their concentration.

Fairly well-defined damage to the human body can be associated with the acute effects following exposure to high concentrations of many toxicants; and correlations of this type have been provided by acute gassing incidents. Unfortunately this information is of little value in efforts to determine the results of long exposure to toxicants which lie above the body threshold and below the acute level, in the region where chronic effects may occur. Post-mortem findings may reveal that damage is present, but such evidence is usually nonspecific and not pathognomonic of the nature of the causative agent.

### **Detroit-Windsor Study**

Possibly more definitive correlations between low pollution levels and resulting chronic effects might be obtained from appropriate exploitation of data from properly designed surveys.

One purpose of the current Detroit-Windsor study is to determine the effects on health of long exposure to common pollutants in a heavily polluted area. We are obtaining detailed records of the sickness of each individual over a considerable period of time in order to compare the amount of chronic disease and other kinds of sickness in areas of different pollution level. The relative amounts of chronic sickness, as measured by such indexes as number of days sickness per person and proportion of medically attended illnesses and of hospitalized illnesses, may also be used for comparison.

We are also collecting information on symptoms associated with chronic disease and on symptoms which represent responses to short-term changes in air pollution levels.

### **Three Hypotheses**

While surveys of this type represent one approach toward solving some of the air pollu-

tion problems, there is no lack of hypotheses to explain the unaccountable high irritant and toxic properties of urban smogs.

Among these hypotheses, that of synergism has been frequently discussed. Evidence has been provided to show that synergistic effects arise out of the actions of certain toxic mixtures, but in general such evidence either deals with systems which are of little importance in our problem of urban air pollution or does not meet the requirements of a statistical demonstration of true synergism. It is necessary that this whole field be examined in detail, with particular attention being paid to the design of the experiments.

Two other hypotheses, which we may call the solubility and adsorption hypotheses, have been put forward.

If we imagine that some mechanism exists whereby relatively enormous absolute amounts of irritants can be abstracted from an atmosphere and transported to the lung during respiration and there undergo some interfacial phenomenon which permits the release of these large amounts of irritants or toxicants, then the existence of such a mechanism would afford an explanation of the enhanced effect of smog atmospheres containing only small concentrations of irritants per unit volume. Since smog contains droplets of water and aqueous solutions, it might be that these could dissolve large amounts of irritants, such as sulfur dioxide, carry them into the lung, and liberate the gas in contact with the alveolar epithelium.

Similarly, particles of carbon or fly ash might adsorb sulfur dioxide, transport it to the lung, and again release it locally.

Existing data relating to the solubility and to the adsorption isotherms of common air pollutant gases in the usual droplet and particulate constituents of smog are far from complete and in general do not extend down to the region of the low partial pressures of gases which are present in smog in, at most, a few parts per million.

Work is now in progress in Canadian laboratories which is designed to provide evidence relating to these three hypotheses. Ultimately it may develop that a full explanation of the high biological activity of urban smogs will re-

quire a recognition of the contributions from these three mechanisms and possibly others, acting simultaneously and also interacting with each other.

Our interest in submicron particles has led to reports on problems relating to the use of microchemical and electron microscopic techniques in connection with the analysis of these fine particles.

Owing to the lack of basic experimental data, our knowledge of the health implications of these concepts is still beyond our present reach, and the final answer is dependent, in part, on work yet to be performed.

## The Sarnia Survey

**PHR** An example of how industry is fighting a front guard action against air and water pollution may be seen in the cooperative investigation undertaken by foresighted industrial companies in the Sarnia basin, Ontario, Canada.

Sarnia faces Port Huron in the United States. About 60 miles northeast from Detroit, it lies in the heart of Chemical Valley, on the east bank of the St. Clair River, where the river waters leave Lake Huron. The terrain is flat. Heavy industries lie along the waterfront. The river is the highway for many obsolete vessels.

Much of the pollution at present results from the poor firing techniques used by these older vessels. When the St. Lawrence Seaway Project is completed, new vessels, designed for the seaway conditions, will be commissioned.

### The Industry Committee

Begun in October 1952, the Sarnia survey is being conducted with the approval of the Research Council of Ontario, and in cooperation with the Ontario Research Foundation. Can-

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*By B. C. Newbury, B.Sc., research fellow, department of chemistry, Ontario Research Foundation, Toronto.*

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ada is seeking to prevent conditions in Sarnia from becoming as acute as those in some of the world's major industrial areas.

The companies participating include several oil refineries, plastics, synthetic rubber, and carbon black plants. Oil companies and these other heavy industries are especially alert to the danger of loss and pollution.

Half the cost is paid by the Provincial Government of Ontario and half by the participating industries. This latter amount is allocated by agreement among the companies.

Industry representatives meet monthly to discuss progress with the foundation's air pollution staff. Committee members have the confidence of top management in their ability to make sound recommendations.

The group does not attempt to regulate. Its function is to discover the constituents and concentration of pollutants and to devise methods of suppression. It does not encroach on the rights of the International Joint Commission from whom it receives technical assistance in the application of the same techniques now used in the Detroit-Windsor survey.

A subcommittee of the research council watches the progress of the survey.

The success of the enterprise is not to be measured by physical means. From the original gesture made to the public by the member companies, a chain reaction was started.

The industries have already observed a surge of interest in air pollution. They are experiencing a spontaneous interchange of data. Other companies have asked to join in the project. A continuous study of present and future pollution problems is under way in each plant. Public appreciation of the problem and community public relations have improved noticeably. The city council and the city's air pollution committee are more than cooperative.

The industry committee is convinced that enlightened manufacturers who fearlessly and publicly gather the facts about avoidable pollution, and then act on their findings, are realizing that enforcement legislation need be reserved for nonconformers only.

### The Survey Design

Sarnia has been divided into three zones of pollution: medium heavy (65-100 tons per

square mile per month), medium (50-65 tons), and low (35-50 tons). The low pollution zone includes most of the residential area. Ships and the associated docking activities may be responsible for a dust fall of the order of 20 tons/sq. mile/month.

The research foundation is responsible for the correlation of all data collected. Its air pollution laboratory has set up a master recording station in one of the more heavily polluted parts of the residential area.

The station is in an open space about 2 miles from the major industries and approximately in line with the direction of the prevailing wind. It houses a Thomas autometer, Bendix-Frieze anemometer, Hemeon and high-volume samplers, and a dust can.

Meteorological data are compiled at the station, and a continuous record of sulfur dioxide concentrations have been kept since the start. Data are needed on vertical temperature distribution, but there is no local television transmitter to which thermometers could be attached.

Nine dust cans are serviced by the foundation in the residential area. Ten in the industrial area are owned and serviced by the industries themselves. Each company is responsible for taking and analyzing stack samples and dust samples deposited on its own site and for financing these tests. The results are given to the foundation.

Every test made is duplicated by a similar test at the master station, so that data for simultaneous conditions can be compared.

Each can location is associated with a sampler location, usually within 50 yards. The sampling filters can be mounted on hydroelectric poles and plugged into the public electricity system.

Two high-volume aerosol runs have already been conducted, but the samples were not sufficiently large to give long-term averages.

In order to monitor the sulfur dioxide and other gases at locations other than at the master station, a mobile trailer laboratory was designed. The towing unit is a standard station wagon.

The trailer is a self-contained unit, carrying its own water, heat, and power supply, but it has proved more practicable for the laboratory to take its power from the public system. Fu-

ture units will be built to tap the public supply for heating and power.

This traveling laboratory has made it possible to carry out runs with a Thomas autometer at varying locations much more cheaply than at a series of fixed stations. The unit has been of great value in measuring the level of sulfur dioxide and in indicating the relative contributions of the various sources to the total pollution recorded at the master station.

Water samples are taken in duplicate at the head of the river, at the inlet to each plant, and at a location well below the industrial area. Each sample is analyzed in two different laboratories before the results are forwarded to the foundation.

Further water testing is the responsibility of the Ontario Department of Health, which has been monitoring the river for many years.

## Code of Good Practice



The pollution of the air by dust particles and gases leaving the stacks has taken serious aspects in several districts of the Netherlands. Although deposits of solid matter may cause considerable inconvenience and nuisance in residential districts, complaints will generally be raised only by people living within a few miles around the plant. Analyses of such deposits shows that the percentage of coarse dust particles is predominant whereas the amount of very fine particles with a diameter less than 10 microns ( $d < 10\mu$ ) is generally minimal.

Recent investigations made near a large power station, where people were complaining bitterly of deposited dust, showed, for example, that 75-80 percent of the dust collected in the exposed region consisted of particles larger than  $50\mu$ , whereas dust leaving the stacks contained only 10-15 percent particles with  $d > 50\mu$ .

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*By A. J. ter Linden, professor of mechanical engineering, Technical University, Delft, Netherlands.*

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*By B. C. Newbury, B.Sc., research fellow, department of chemistry, Ontario Research Foundation, Toronto.*

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Immediately a number of patients showed an increase of the subjective symptomatology of their diseases. This matter amused the technicians and contributed to creating the conviction that the complaints had a speculative origin. However, we doctors know, through our research into physiology, and particularly of conditioned reflexes, that complaints of ill people find adequate enough an explanation in physiology.

Yes, Italy, too, suffers from injury to man and animals, and damage to property from atmospheric pollution. We must admit that complaints against industry are fairly frequent and that many cases reach the courts.

We have had many cases of mass toxicity, some sensational, from atmospheric pollution within plants, caused either by faulty construction or erroneous placement of rooms. We have had other frequent collective toxicity caused by carbon monoxide in factories.

In comparison with Italy's well-known cases of toxicity taking place within the factory, many cases resulting from industrial atmospheric pollution escape the diagnostic judgment of the physician. Furthermore, the distillation of industrial effluents in the atmosphere for not such as to bring about well-defined toxic factors to be attributed with certainty to any given product. Our diagnostic means do not yet permit us to establish a definite diagnosis of functional or organic symptoms caused by a long exposure to low concentrations.

We often do not take into consideration the injuries suffered by persons as a result of atmospheric pollution. We do not include in our calculations those people who are either ill or physically unfit, and especially children, pregnant women, hypersensitive individuals, for whom small doses of dust, gas, vapors, or odors may not be only harmful, but toxic, and even fatal. In my opinion many cases of diffuse eczema, asthma, rhinitis, and allergic conjunctivitis are brought about by sources of industrial pollution often escaping the patient's and the physician's attention.

I close with the suggestion that the maximum publicity be given to all devices discovered or invented which may contribute to the purification of the atmosphere. This dissemination of information is necessary so that all countries

may take advantage of technical improvements. Such information also will make it possible for health authorities to require the installation of those new devices in order to safeguard the health of their citizens.

## The Air Pollution Syndrome



On the industrial front it is most often the local plant manager or the small local industrialist, and not the big industrial statesman back at company headquarters, who has to deal with the problems of air pollution in his community, and who so often makes such heavy weather of it.

The local industrial manager often finds himself in a curious, frustrating situation. He is successfully running a plant to produce goods that people need and want. He is constrained by the hard laws of economics to produce these goods at lowest possible cost and to sell them at a profit.

He finds himself in a community that should, in his opinion, appreciate the job he is doing to provide work for its citizens and a market for some of its local products and services. Yet, unaccountably he finds himself under fire because now and then his plant has been emitting a little smoke or fly ash, or possibly some bad odors. It is even possible that the local newspapers have assailed him with editorials. Lawsuits, threatened or actual, may be hanging over him.

Under these circumstances, the industrialist is likely to react according to what we recognize as the industrial "air pollution syndrome."

Local managers of industrial plants are often of the old tradition still, when it comes to public and community relations, especially in air pollution matters. When complaints are first

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*By G. Edward Pendray, senior partner, Pendray & Company, New York City.*

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made about smoke, fly ash, fumes, or whatnot, often communicated by friends, two sorts of self-contradictory replies are commonly made.

The first is generally to the effect that it isn't so. I have known instances where this kind of retort was made even though, at the very moment, visible clouds of smoke were pouring from the stacks and fly ash particles were falling like gentle rain. Obviously this answer satisfies nobody. But it convinces both the friends and opponents of the management that the plant will not take a hint.

When agitation increases, the manager's next retort is likely to the effect that—well, it's an industrial area. The plant was there long before the town grew to its present size. If people want to move into an industrial community, they must take the consequences.

The net effect is to make everybody mad. An antiplant movement is likely to take organized form. There will presently be meetings, speeches, and letters to the editor. Before long, a vocal opposition develops—an opposition that has become convinced that political or legal action is necessary to make the plant take the steps required.

### The Start of Fireworks

At this point, the manager asks the advice of legal counsel. The lawyer generally advises that any kind of statement, other than denial, may constitute an admission of fault and therefore be costly.

So the management, which up to now may have handled the matter only blunderingly, takes a worse step. It begins to act guilty. It refuses to discuss the pollution problem, perhaps even maintaining there is none.

A delegation of citizens comes to discuss the question, hoping to find a meeting of minds, or to be able to report progress. The management may refuse to see them, or may have a lawyer do the talking. The local paper may send a reporter out, with a view to helping the management off the spot. The reporter gets barred at the gates, or is told that the company has no statement for the press, or is handed a brief denial of all guilt, patently written by an attorney.

By this time the stage is set for real fire-

works. What started out to be a simple problem of dealing with a natural community desire for better living has by now been blow up into a crusade. Employees find themselves in disfavor with their neighbors. The company now has an employee morale problem added to its other difficulties.

Presently a pollution ordinance is passed, or if the community already has one, it is given teeth. A policeman, under one title or another, is appointed to deal with the plant. Regulations as to the amount of smoke, fumes, pollutants, and the like are adopted—often without any idea of their effect either on the nuisance or on the economics of the community.

The plant is at last forced to yield or to take the remedial measures which, had they been undertaken voluntarily, would have gained the company credit for public spirit. But now, though the cost is the same, or maybe greater, the company comes out of the quarrel with a black eye. Its employees are confused and alienated. All private industry has received another setback in the community.

Unfortunately, it is not possible to tell how widespread situations of this kind are today. But there are a great many more of them than most industrial managements know about or will admit.

I know of one city where the local manufacturers association has a fine-sounding air pollution control committee. Its members include representatives of the city's leading industries. There are several plants in this city that have done nothing, except to make promises, to solve a shockingly bad smoke and fume pollution situation. The committee doesn't even meet. Some of its members have said that the committee is afraid to acknowledge the existence of the pollution problem because then the community will demand too drastic a cleanup.

In the meantime, the community is demanding a cleanup anyway. A citizens committee on air pollution has also been organized, and it meets. In this city it is not just one plant that is going through the syndrome. All industries seem to be following the same foolish course collectively.

On the other hand, there are many communities where the investment of major companies in research, air pollution control, and intelli-

gent community relations practices has really begun to bear fruit. Some are even reaching the point where the citizens can actually bring themselves to believe that some factors other than industry are adding to air pollution—communities where apartment houses, private homes, municipal plants of various kinds, garbage dumps, and even autos and buses are coming in for their share of critical examination and efforts at control.

Many a company has discovered that air pollution problems can also be community relations opportunities. I know of several that have gone through the air pollution syndrome, and, as a means of clearing up its aftermath, have organized complete and effective community relations programs, only to discover with delight that these activities have brought them great and unexpected gains in better employee morale, better community and supplier cooperation, and have even enhanced their reputation far beyond the communities immediately concerned.

I think all industry will ultimately make this kind of discovery. It is a good thing, too, for in my opinion the necessity to control air pollution will grow—rather than diminish in the future—because air pollution is one of the diseases of increasing population, and population both in the United States and all over the world will continue to increase, at least throughout the balance of this century.

## Not Instruments Alone



Periods of aggravated air pollution are usually recognized because of reduced visibility, effects on health, and damage to plants. Damage to vegetation annually causes great economic loss. Typical of the sources of the several pollutants

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*By J. T. Middleton, Ph.D., plant pathologist, department of plant pathology, University of California, Riverside, Calif.*

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contributing to this loss are the processes associated with chemical manufacture, ceramic production, and combustion effluents.

Not only is the effect of pollution on the plant of economic importance, but the response of the plant to the pollutant is useful in estimating the severity of the problem. By their response as a biological system, plants provide a convenient method for recognizing the presence of airborne contaminants, determining the distribution of the pollutants, assisting in an estimate of the level of pollution, and providing a passive collection system for subsequent chemical analysis.

The use of plant material has certain limitations. Among the more important is the non-specific response of plants to some chemically different airborne constituents.

### Use of Instruments

The development of instruments for monitoring and recording toxicant levels has made an assay of local pollution more effective. The Thomas autometer is used for accurate and continuous determination of levels of sulfur dioxide and, by the addition of a combustion chamber, for recording the total sulfur in the atmosphere.

This machine has obviated the need of a biological system for noting sulfur dioxide. However, when it is used to record sulfur dioxide and total sulfur concentrations, discrimination between hydrogen sulfide, other sulfurous materials, and sulfur dioxide cannot be completely assessed, and further interpretation is made possible by the response of test plants.

Recording devices are becoming available for the measurement of halogens and halides. The automatic recording of atmospheric fluoride through an apparatus developed by the Stanford Research Institute should aid greatly in monitoring this effluent in areas adjacent to sources of fluorides. Until such equipment is available, noting the response of plants remains a useful method.

Levels of airborne fluoride can be detected by using a variety of plant materials and noting the species affected. The gladiolus has proved satisfactory for measuring concentration, gra-

dient, and geographic distribution of the toxicant. Plants resistant to injury from fluoride can be used as passive collectors, and the level of pollution can be determined subsequently by chemical analysis.

A new Beckman instrument provides a continuous record of oxidant level based on the colorimetric measurement of iodine released from neutral buffered potassium iodine. During periods of aggravated pollution in the south coastal basin of California, elevated oxidant levels have been recorded. Investigations by Haagen-Smit have shown that oxidants resulting from ozonation of unsaturated hydrocarbons produce reaction products which are responsible for the smog injury common to California's urban areas.

### Nature's System

Research at the University of California at Riverside has corroborated the findings of Haagen-Smit. The specific response of pinto beans, grown under controlled conditions, to the reaction products of oxidation of hydrocarbons and ozone has provided a ready means of determining the presence in the atmosphere both of oxidized material and of ozone.

Exposure of test plants to oxidized hydrocarbons has shown that silvering and bronzing is limited to the lower leaf surface. Controlled fumigations in which ozone is introduced into the fumigation space have shown that the upper leaf surface is bleached and mottled with no injury to the lower. When both oxidized hydrocarbons and surplus ozone were present, bleaching of the upper leaf surface and silvering of the lower resulted.

A 1954 survey was conducted with the Air Pollution Foundation to determine the relation between plant damage and oxidant level as measured with the Beckman oxidant recorder. Exposed pinto bean plants were evaluated on a subjective basis for the presence of damage caused by oxidized hydrocarbons and that due to ozone only. Test plants were found to be regularly injured by oxidized hydrocarbons. Only twice was there a suggestion of some ozone damage. Yet pinto beans are much more sensitive to ozone. Analyses thus far completed support the view that the reaction prod-

uct of oxidized hydrocarbons rather than ozone is the principal phytotoxicant present in the southern California coastal basin.

This evaluation could not have been made with instrumentation alone and well illustrates the need and value of analytical biological systems since the machine apparently cannot distinguish between the two toxicants.

## Measuring Particle Size

**PHR** There has long been a desire for a rapid method to determine the particle size and size distribution in an aerosol of nonuniform particle size. This desire ranges from a vain wish for an instrument that will automatically plot a size distribution curve from a sample in situ to an approximate method of measurement of the average size.

Continuous and automatic measurement of predominant particle size by light-scattering is one method of rapid approximation. It provides measurements on the aerosol in situ with a minimum of disturbance.

Other methods of illumination have been used, but the one I propose appears to be the simplest feasible optical system. It partly overcomes the multivalues of most light-scattering functions, such as scattering cross section, depolarization, and ratio of forward to back scattering. The method will tell nothing about the distribution of particle size, but it will tell the predominant size within a certain range.

Two light-scattering chambers and two phototubes are required to simultaneously record the forward and 90-degree scattering, either of which can be used as a measure of concentration. A constant source of white light is necessary for sufficient stability and intensity.

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*By David Sinclair, Ph.D., senior research physicist,  
Johns-Manville Research Center, Manville, N. J.*

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The aerosol is drawn continuously through the two chambers in quick succession. One has darkfield illumination similar to that used in the Sinclair-Phoenix aerosol photometer, except that the cone of incident light is narrower. Illumination is provided by an annular ring at angles between  $5^\circ$  to  $7\frac{1}{2}^\circ$  from the axis, allowing observation of scattering at angles from  $2^\circ$  to  $10^\circ$ .

The source, a coiled tungsten filament, is focused on the aerosol passing through the chamber in a narrow stream at right angles to the axis of illumination. The aerosol is collected on a filter to determine mass concentration and calibrate the instrument.

A wide angle cone of illumination is used in the second chamber. Observation is made at right angles to the axis of illumination. The scattering from each chamber may then be measured simultaneously with separate photomultiplier tubes and the photocurrent amplified and recorded continuously. The normalized relative value of the two readings is a measure of the particle size or sizes which produce the predominant light-scattering effect. The larger sizes greatly predominate over the smaller, a defect common to all light-scattering measurements, as well as other measurements made on the aerosol as a whole.

Performance calculations show that the ratio of small-angle forward scattering to right-angle scattering is single valued over a large and useful range of particle size. This ratio increases continuously, but not uniformly, from 2 in the very smallest region of sizes to about 500 at a diameter of 6 microns.

Measurements of this ratio in a nonuniform particle size aerosol could be used to determine an approximate average particle size or whether a change in scattered light intensity was caused by a change in the particle size or a change in concentration.

The change in size will be obtained only approximately, but the details are frequently not needed. A detailed size distribution curve may often be obtained with the electron microscope, but the labor involved is enormous. However attractive such a curve may look on paper, it is frequently more important to observe the integrated effect of the aerosol, such as the visibility and mass concentration. The photom-

eter will give a continuous record of such information with a minimum of effort and, with proper calibration, will give information about particle number concentration and size.

## Efficiency of a Cyclone

**PHR** The separation of dust from a gas stream in a cyclone, the most important industrial type of centrifugal dust collector, is often hindered by air leaking into the dust bunker.

At the Mining Research Establishment of the Netherlands State Mines at Treebeek, Netherlands, experiments showed quantitatively the detrimental effect of this leakage.

Leakage may be the source of clogging or extreme wear of the cyclone, but most important is the low efficiency and high dust content of the cleaned gases caused by it.

Leakage of air into the bunker is only possible if there exists a pressure difference between the outside and the inside of the bunker. The bunker pressure is, of course, lower than the atmospheric pressure when the gas outlet of the cyclone is connected to the intake of a fan. But even in the case where the gas outlet opens directly into the atmosphere the pressure in the dust outlet and in the dust bunker may be lower than the atmospheric pressure and be the cause of leakage.

As a result of the tests it appears that the pressure in the dust bunker rises when the diameter of the dust outlet increases. This may be a means to diminish the pressure difference between dust bunker and atmosphere and to prevent, in this way, the leakage.

It is shown that, when there is no leakage, increasing the dust outlet size has sometimes the agreeable consequence of increasing the col-

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*By H. J. van Ebbenhorst Tengbergen, mechanical engineer, Mining Research Establishment, Staatsmijnen in Limburg (Netherlands State Mines), Treebeek, Netherlands.*

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lecting efficiency of the cyclone. The detrimental effect of air leakage on the collecting efficiency is smaller with a large dust outlet than with a small one.

In the investigations the dust outlet area was varied by more or less lengthening the cone of the cyclone within the bunker.

For the sake of simplicity, the tests were carried out with a single cyclone placed in a gas transport system, although the cyclone was not always of the same type. The same conditions would apply, however, to cyclones placed in parallel or to multicyclones. The dust—in all tests the same foundry dust was used—was introduced into an airstream, which by means of a fan was forced through the cyclone and then returned into the atmosphere through a filter bag. Tests were carried out with both large and small bunkers, but the capacity of the bunker had no appreciable influence.

In many cases the bunker pressure cannot be made equal to the atmospheric pressure. Then the valve or sluice under the dust bunker has the difficult task of preventing any leakage from outside to inside and, at the same time, of letting the dust flow freely in the other direction. In the paper several constructions are shown.

## Injuries to Vegetation

**PHR** Portugal reports two cases of damage to forest stands of maritime pine (*Pinus pinaster* Sol. ex Ait) and blue gum (*Eucalyptus globulus* Labill.) which point to atmospheric pollution by sulphurous gases.

This conclusion was reached as a result of our observations in the field, the peculiar symptoms

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*By Natalina Ferreira dos Santos de Azevedo, forest pathologist of the Direction General of the Forest Services and of the National Agronomic Station, Lisbon, Portugal.*

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in evidence on the affected trees, the general aspect of the surrounding vegetation, the near-by presence of smoke emitters, and the microscopic and chemical analyses in the laboratory. There is no question of biotic disease.

But it was on the assumption that an unidentified and highly destructive disease was spreading among the pine and eucalypts in two forest conservations in the District of Aveiro that I was sent in 1953 to survey the damage.

The first case was that of a mixed stand of pine and eucalypts, where the latter was the dominant species, surrounding a small mine working a smelter for pyrites. On approaching the premises, I became aware of a strong irritation of the eyes and the mucosae of nose and mouth. I even had violent fits of coughing and a sense of suffocation, suggestive of a high sulfur dioxide concentration in the air.

The pines in this stand did not undergo such severe injuries as appeared on the leaves of the eucalyptus trees. In the early stage of damage, red and brown patches, outlined by a thickened rim, appeared on the leaves of the latter. In the more advanced stages of the attack, silver specks and patches developed, which ultimately would turn into large corroded areas. The whole leaf would then become dry and deciduous, leaving the trees completely bare.

The second case was that of two pine stands (with a few eucalypts in one stand) in the vicinity of a brickyard, where the wind spread the exhaust gases from an oil engine over most of the nearby trees, causing very severe damage.

The pines, especially, presented the aspect of a greatly lowered vitality, and their needles were very thin and small.

A great many were dry or even burnt. Secondary branches, the upper part of the trunks, and the twigs were soft—not “woody”—to the touch when pressed between the fingers. They could easily be bent without breaking. The trees were covered all over with black soot. The damage in these stands was considerable—a great number of trees had been killed.

The pines unquestionably had suffered most, but the eucalypts also presented nearly all the symptomatology described for the first case.

With the expansion and modernization of many small industrial enterprises throughout Portugal it is no longer rare to meet with forest

units in the vicinity of factories showing evident signs of greater or lesser degree of damage not caused by pathogenic agents.

## The World Supply of Sulfur



Sulfur, one of the first chemical elements used by mankind, has maintained its position as an essential material through the ages of history.

The pattern of use by a nation is an accurate gauge of the extent and nature of the nation's industrial and agricultural activity.

As each new industrial or agricultural development has occurred, some new application of sulfur generally has resulted. In the atomic age of today, the versatility and indispensability of the element continue to be demonstrated.

Sulfur and the chief form in which it is used, sulfuric acid, are warp and woof of our own industrial economy. As a nation, we consume 3 times as much sulfur as aluminum, 4 times as much as copper, 5 times as much as lead, 5 times as much as zinc, about 50 times as much as nickel, and more than 90 times as much as tin.

### Sources of Sulfur

The discovery of native sulfur in the United States and the invention of the Frasch hot-water process for mining the element changed the pattern of world supply and set the stage for the important role sulfur was to play in the industrial growth of the future.

Among the forms in which sulfur is commonly found are native sulfur, or brimstone, the principal source of which is the salt dome deposit; metallic sulfides, principally pyrites; sulfide gases associated with natural gas and petroleum; and natural sulfates. Although not an important source of supply at this time, the natural sulfates, principally anhydrite and

gypsum, occur so extensively as to be almost inexhaustible.

A second major source of supply is the limestone and gypsum formations in Sicily and on the mainland of Italy. A third source originates in volcanic activity. Important deposits are found in Japan and the Andes Mountains of South America.

Large deposits of the pyrites, the iron sulfide minerals containing from 25 to 50 percent sulfur, are located in the southern part of Spain and Portugal. Other major reserves are in Cyprus, Norway, Sweden, Finland, Japan, Italy, Germany, France, Canada, Australia, and elsewhere.

A secondary source of sulfur related to sulfide minerals is the sulfur dioxide in stack gases of smelters treating sulfide ores for the recovery of copper, lead, and zinc. Sulfur dioxide contained in these gases is usually converted to sulfuric acid in contact acid plants. Feed gases are first cleaned and dried before being fed to the catalyst. In other instances, the smelter gases are used in the manufacture of liquid sulfur dioxide or ammonium sulfate.

Another source of byproduct sulfur is the hydrogen sulfide in natural, refinery, and coke oven gases. In the recovery of sulfur from gases, hydrogen sulfide is first extracted from the source gas with selectively absorbent solutions. High-strength hydrogen sulfide gas is then stripped from the absorbent and fed to a furnace where combustion air is introduced to burn about one-third of the hydrogen sulfide to sulfur dioxide. The mixed gases are cooled and passed through a catalyst to form sulfur and water vapors. These vapors are cooled to condense the sulfur to a liquid state, while most of the moisture is discharged as vapor with the exhaust gases.

The amount of sulfur recovered from hydrogen sulfide in sour natural gas and in refinery gases in the United States alone has increased from 57,000 tons in 1949 to an estimated 350,000 in 1954. At the same time the number of recovery plants has increased from 4 to over 30.

A number of factors has stimulated the recovery of sulfur from these gases. The mounting demand for natural gas had led to the development of new natural-gas fields in the

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*By J. C. Carrington, vice president, Freeport Sulphur Company, New York City.*

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United States and Canada having a hydrogen sulfide content as high as 50 percent. Before this gas can be used, the hydrogen sulfide must be removed. In addition, the drive to reduce atmospheric pollution at refineries has exerted a strong influence.

### A World Pool

The free world draws in varying degree upon all of the sources mentioned for its supply of sulfur. The supply may be considered as a huge pool, filled by production from some 40 different countries. The production of sulfur and sulfur-bearing materials has been growing steadily. Major changes have occurred since 1949 in connection with the production of Frasch sulfur.

In 1953, the estimated sulfur consumption of the free world was about 12.5 million long tons. Consuming nations took from the supply pool about the same amount that was put into it. The excess of production over consumption amounted to only 200,000 tons, or less than 2 percent of the total. The present supply-demand picture is one of ample production and productive capacity, and the history of sulfur consumption would indicate a continuing growth in the use of the element.

## Powerplant Stack Gases

**PHR** So far as is known, the only power stations in the world in which flue gas is washed are in Great Britain. Although powerplants burn only about one-fifth of all coal consumed and mostly discharge stack gases into the atmosphere at a much higher level than other consumers, interest has continued for many years in the possibility of lowering the concentration of sulfur dioxide in powerplant stack gases.

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*By R. Llewellyn Rees, M.A., M.I.Chem.E., chief chemist, British Electricity Authority, London.*

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Interest has been intensified by the rate of growth of electricity generation, by the trend toward high concentrations of sulfur in the fuel above the normal average of 1.5 percent, and by the effects of the 1952 London fog, which led to the formation of the Committee on Air Pollution.

One of the committee's many recommendations is the removal of sulfur from flue gases at new power stations in populated areas. The British Electricity Authority has been studying the whole subject since its formation in 1948.

### Gas-Washing Processes

The principal difficulty in the way of devising a satisfactory flue gas-washing process for a modern powerplant lies in the severe requirement that at least 90 percent of the sulfur dioxide must be removed from gases flowing at a rate of more than 1 million cubic feet per minute, when the original concentration of sulfur dioxide is 0.1 percent or less. The washed gas, unavoidably cooled in the washing process, comes to ground so much nearer the stack than hot unwashed gas that there might be no improvement in the maximum ground level pollution by sulfur dioxide if a lesser amount were removed.

This difficulty rules out a number of processes that are used effectively at smelters, where the initial concentration of sulfur dioxide is much higher, and where a higher residual concentration of sulfur dioxide is deemed satisfactory.

Other difficulties too are presented by the problem of coupling the process to the generation of electricity at a cost that is not prohibitive, by the presence in the gas of other constituents which may lead to unwanted and wasteful side reactions or to contamination of the end product of the process, and by the large-scale operation required for waste disposal or sale of an end product being produced in some instances at the rate of 20 to 40 tons an hour.

From the point of view of British authorities, there are only three gas-washing processes which show promise at present for active chemical engineering development. These are the Battersea effluent process, which is severely restricted in its application by site require-



ments; the cyclic lime process, which is extremely costly and presenting a huge waste disposal problem; and the ammoniacal liquor process, which is restricted in its application by the supply of ammoniacal liquor, and which has only just passed from the laboratory stage to that of the pilot plant. Only the last is productive in the sense that any value is derived from the sulfur dioxide in the flue gases. One advantage is that the ammonium sulfate market is not likely to be upset by its operation.

### Value of Tall Stacks

There has been considerable debate over the real value of gas washing in alleviating air pollution, whether it is sufficient to discharge the gases from tall stacks or whether it is also necessary to wash the gas.

At first sight it seems that the removal of some tons of sulfur dioxide hourly from the gases leaving a powerplant is bound to improve the state of the atmosphere substantially. This is undoubtedly true when the gas is discharged from stub stacks in such a way that it is caught in the down eddies that form in the lee of the buildings, as happens at older plants.

All but one of the newer powerplants in Great Britain have stacks at least  $2\frac{1}{2}$  times the height of the buildings and at least 300 feet high. Thorough surveys by the British Electricity Authority have showed that in no instance has it been possible to detect any changes in the monthly mean sulfation rates that can be related significantly to the amount of coal burned in the plant.

The implication is that either the technique of measuring the rates is inadequate for measuring the extent of pollution or that our method of discharging the gas hot and at speed from high stacks gets it sufficiently well dispersed into the atmosphere before it can reach ground level.

Conversely, gas washing cools and saturates the gas, which falls to the ground from time to time quite near the power station although discharged from tall stacks. The fall is most frequent and rapid when the wind is light and variable, an effect so far not taken into account by the equations describing dispersal of gases from tall stacks.

In practice, however, this effect is important to the London public. People complain about the emission from the city's power stations, when most of the sulfur dioxide has been removed, but make no complaints about the other powerplants with tall stacks where gas washing is not in use.

It is also worth noting that washed gas has no chance of escaping through the ceiling of an atmospheric inversion, whereas hot gas leaving high stacks has a good chance.

It may be concluded that the removal of sulfur dioxide from flue gas in its present state of development leads to loss of goodwill in the neighborhood of the powerplant. A lowering of the general level of air pollution, which would seem to be an obvious result, has not been disclosed by the methods of measurement that have been used to test the improvement. Whether the gain can be worth the extra cost in the price of electricity that the gas washing would necessarily entail has still to be decided.

## Sulfur in the Steel Industry

**PHR** It is significant that classical and medieval literature has always associated the art of metalmaking with the lower regions—with torment, fire, and excessive labor—and that the flames of Hades were associated with evil-smelling, poisonous flames of sulfur.

So far as ironmaking and steelmaking are concerned, everlasting torment and sulfur have always been synonymous terms. The presence of sulfur in iron and in steel, except under certain conditions, is harmful, and rigid limits on the amount permissible are imposed by standard specifications.

No matter what the sulfur content of the raw materials used may be—and practically all iron

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*By T. P. Colclough, C.B.E., D.Sc., M.Met., technical adviser, British Iron and Steel Federation, London.*

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ore, limestone, and the fuel particularly, contain sulfur in varying but marked degree—the sulfur content of the finished iron or steel product cannot exceed a specified percentage, 0.05 percent or even less.

In the steelmaking operation, the sulfur content of the raw materials must be reduced to below the limits imposed by the specification for the finished steel. The whole of the sulfur removed from the metal is retained in the furnace slag, and it is imperative that no sulfur enter the metal or the slag from the fuel used. Its combustion must be complete, and the sulfur content must be converted to sulfur dioxide. Chimney gases from the furnaces carry away all the sulfur dioxide formed. The same conditions apply to the rolling and forging heating operations.

In the manufacture of the coke which is used in the blast furnaces, some 60 percent of the sulfur in the raw coal is retained in the coke; 40 percent is found in the tar and coke oven gas. This sulfur is removed when the gas is used for public utility purposes and under certain conditions can be removed economically when the gas is used for steelmaking or other industrial purposes. Some 14 percent of the total sulfur in the raw coal carbonized is contained in the stack gas from the ovens where unpurified gas is used for underfiring. The remaining 86 percent is retained in the coke and other byproducts.

In the smelting of pig iron, the whole of the sulfur present in the coke, ore, and other raw materials used is absorbed in the blast furnace slag with the exception of a small percentage in the iron itself. No sulfur-bearing gases are formed.

#### Fuel—The Problem

The iron and steel industry presents no unique problem so far as pollution of the atmosphere by sulfur is concerned. In fact the only sulfur emitted arises from the fuel which is used for the thermal requirements of the process, and the amount, measured as percentage of the sulfur entering the system, is far less than in many other industries.

The sulfur pollution of the atmosphere by the industry arises essentially from the combus-

tion of the fuels which it consumes. The elimination of this pollution is shared in common with all fuel users and can only be attained by a reduction of the sulfur content of the fuel supplied and the removal of the sulfur-bearing constituents of stack gases, or by both practices.

The steel industry in the United Kingdom may be regarded as removing some 48 percent of the total sulfur present in the various fuels which are consumed and, to this degree, makes a marked contribution to the problem of reducing the pollution. However, this statement does not in any sense minimize the importance of preventing the pollution which still exists.

A determined effort has recently been made in the United Kingdom to develop an economic wet absorption process which will eliminate or reduce the sulfur content of coke oven gas used internally as fuel. Considerable difficulties have been encountered, arising mainly from the extremely corrosive action of the solutions formed, but so far the process has been a success to the point that 80 percent of the sulfur can be removed and recovered in the form of sulfuric acid.

This means that the pollution of the atmosphere from this purified coke oven gas, when used, will be far below that of any other type of fuel available. If similar processes can be applied on a wide scale, a marked contribution can be made to the solution of air contamination.

## A Scrubbing System



It is one thing to develop a method for the elimination of air pollution. It is something else to find a method that is economically sound, at least to the extent that it does not make the entire operation a cost burden. It is also important

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*By Clayton Lawler, B.S., technical director, Western Sulfur and Acids Division, Olin Mathieson Chemical Corporation, Little Rock, Ark.*

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that the method selected does not convert an air pollution problem into a water pollution problem which cannot be handled.

We believe these criteria have been met successfully in the sulfur dioxide removal system installed more than a year ago in the large sulfuric acid plant of the Olin Mathieson Chemical Corporation at Pasadena, Tex. We see tremendous possibilities for application of this extremely efficient system to the removal of sulfur dioxide from powerplant stack gases.

The process is a modification of the single-stage recovery system pioneered by the Consolidated Mining and Smelting Company of Canada. The modified design, which is in effect a 2-stage unit provided with automatic controls, yields an exit gas containing less than 0.03 percent sulfur dioxide, a very low level which will be more than satisfactory to any community. The system is so designed that a minimum of ammonium sulfate is formed and a maximum of sulfur dioxide is removed from the gas stream. It operates at low temperatures.

The system involves the use of an oversize scrubbing tower made of redwood and a stripper for recovering the sulfur dioxide from the ammonium sulfite-bisulfite solution. The upper section of the tower is separated from the lower section. Absorbing solution is circulated to the top section to remove all but traces of the sulfur dioxide. Anhydrous ammonia is continuously added to the scrubbing solution as makeup for that which is converted to ammonium sulfate. The addition of water to the system maintains the solids concentrations at the optimum value for effective operation. The inert gases are discharged to the atmosphere from the top of the tower.

Exit gases from the acid plant containing sulfur dioxide, which formerly was discharged to the atmosphere, now enter the base of the new tower through a vestibule. Solution is continuously bled from the scrubber to the stripper. Sulfuric acid is added to the stripper to convert the ammonium sulfite-bisulfite to ammonium sulfate and to assist in the evolution of sulfur dioxide. The exit gases from the stripper containing sulfur dioxide and air are returned to the acid plant drying tower for conversion to sulfuric acid. The solution from the stripper

is pumped to an adjacent fertilizer plant as a 40 percent solution of ammonium sulfate. Including handling losses, 97 percent of the ammonia is recovered as ammonium sulfate under normal operating conditions.

## Refinery Sulfur Recovery

**PHR** The disposal of hydrogen sulfide released in some petroleum refining operations poses a problem to refiners. Many have found that easily operated plants which convert the hydrogen sulfide to elemental sulfur provide a practical and profitable means to handle these streams. Not only is the quantity of sulfur compounds emitted to the atmosphere reduced but also an additional supply of a valuable commodity is produced.

In the past, sour, or sulfur-containing, crude petroleum was not generally processed because it added corrosion problems and increased the processing facilities required to meet petroleum product specifications. With the decline of sweet crude reserves, however, it soon became apparent that more sour crudes must be processed.

The sulfur in sour crudes exists in many forms from elemental sulfur and hydrogen sulfide to a variety of complex organic compounds. As refinery facilities for handling sour crudes were installed, it became necessary to dispose of the hydrogen sulfide released from the crude petroleum.

Legal and safety restrictions based upon the odor and toxicity of hydrogen sulfide essentially forbid its being discharged to the atmosphere. To meet these restrictions, the hydrogen sulfide gas streams were burned to sulfur dioxide in a flare stack or boiler before being re-

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*By George E. Smalley, senior process engineer, and James W. Klohr, process engineer, the Ralph M. Parsons Company, Los Angeles.*

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leased to the atmosphere. Sometimes the hydrogen sulfide was converted directly to sulfuric acid.

As cracking and other refining processes increased the yield of useful petroleum products, other forms of sulfur in the crude were converted to hydrogen sulfide. Catalytic refining processes are particularly effective in converting sulfur to hydrogen sulfide.

As more catalytic refining processes are being installed, the amount of hydrogen sulfide released per barrel of crude petroleum is increasing. The quantities of hydrogen sulfide being produced in many refineries today are too large to permit flaring as sulfur dioxide.

Installation of recovery plants to convert the hydrogen sulfide to elemental sulfur is the best solution to the problem.

By the end of 1955 approximately 1,000 tons a day of sulfur will be recovered from sour gases at petroleum refineries throughout the United States. The recovered sulfur will represent a reduction of 2,000 tons a day of sulfur dioxide which otherwise would be released to the atmosphere.

There will soon be 17 refinery plants converting hydrogen sulfide gases to elemental sulfur.

In Los Angeles, such units are daily recovering almost 180 tons of sulfur which would otherwise be emitted to the atmosphere as 360 tons of sulfur dioxide.

### The Los Angeles Ruling

Even though a sulfur recovery plant materially contributes to the reduction of sulfur compound emitted to the atmosphere, until recently regulations in Los Angeles County would not permit the operation of a sulfur recovery plant unless the operator obtained a variance from a special hearing board.

Strict application of the regulation relating to specific contaminants, known as rule 53a, was recognized as a deterrent to the installation and operation of plants that recover sulfur compounds. The regulation permitted no single source of emission to discharge sulfur dioxide exceeding 0.2 percent by volume. Yet, even with 3 or more reactors, incinerator effluent gases could not normally meet the limitation.

To correct this situation, a new rule (rule

53.1) was added in November 1954. The new rule is undoubtedly of interest to other air pollution agencies throughout the country and reads in part:

"Where a separate source of air pollution is a scavenger or recovery plant, recovering pollutants which would otherwise be emitted to the atmosphere, the Air Pollution Control Officer may grant a permit to operate where the total emission of pollutants is substantially less with the plant in operation than when closed, even though the concentration exceeds that permitted by Rule 53 (a) . . ."

## A Gas-Washing Process

**PHR** In the Fulham-Simon-Carves ammonia process for the removal of sulfur dioxide from flue gas, sulfur is recovered in the form of ammonium sulfate and sulfur.

Flue gas is scrubbed with a concentrated solution of ammonium salts, ammonia being added at a rate corresponding to that of the absorption of oxides of sulfur. If pure ammonia is used, the scrubbing liquor contains ammonium sulfate, sulfite, and bisulfite, and oxidation of the solution converts the sulfites to sulfate. On the other hand, if crude ammonia (concentrated gasworks ammoniacal liquor) is used, ammonium thiosulfate is formed in addition to the salts mentioned.

The liquor obtained in the latter case is treated in an autoclave in the presence of a small amount of sulfuric acid, when the sulfite, bisulfite, and thiosulfate decompose to give sulfur and ammonium sulfate as the final products. About 90 percent of the product is ammonium sulfate suitable for use as fertilizer, and about 10 percent is sulfur.

The metropolitan borough of Fulham, London, and Simon-Carves, Ltd., sponsored pilot

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*By H. E. Newall, Ph.D., Sc.D., Department of Scientific and Industrial Research, Fuel Research Station, London, England.*

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plant experiments at the Fulham generating station in 1939 and were granted a patent in 1940. The work came to an end in 1940 owing to the war.

After the war, it was decided, in consultations between the British Electricity Authority, Simon-Carves, Ltd., and a working group set up by the Department of Scientific and Industrial Research, that experimental work on the process should be restarted and that it should be carried out at the Fuel Research Station of the department.

Pilot plant experiments at the Fuel Research Station showed that efficiencies of removal of sulfur dioxide of 80 to 95 percent, depending on the conditions, could be obtained.

Some of the conditions influencing the efficiency were the rate of gas flow, the depth of

the grid packing in the scrubber, the concentration of ammonium sulfite and bisulfite in the liquor, and whether the scrubbing was performed in one or two stages. The maximum efficiency was obtained by a 2-stage process in which the flue gases were scrubbed with a concentrated solution of ammonium salts in the first stage and with a dilute solution of ammonium salts in the second stage.

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*Copies of the full papers may be purchased from the Order Department, American Society of Mechanical Engineers, 29 West 39th Street, New York 18, N. Y. The complete proceedings of the congress will be available in book form after October 1, 1955.*

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## Legal Note on Dual Inspection

In *Falfurrias Creamery Company v. City of Laredo*, 276 SW 2d 351 (Tex. 1955), the Court of Civil Appeals of Texas held unconstitutional the portion of a municipal milk ordinance providing that the city health officer of Laredo shall not accept inspections, examinations, or certificates of any health officer of another city in issuing permits to sell milk. The State Legislature of Texas had enacted as a statewide statute the Milk Ordinance and Code—1953 Recommendations of the Public Health Service.

The city of Laredo contended that in accordance with the provisions of its local ordinance it had the right and duty to inspect the facilities of a dairy at Falfurrias, Tex., 90 miles from Laredo, before issuing a permit to the Falfurrias dairy to sell its milk and dairy products within the city of Laredo. A milk inspection service is maintained by the city of Falfurrias which is fully approved and accredited by State authorities, and the dairy in question had been inspected and passed by the milk inspection authorities at Falfurrias.

The court in its decision indicated that while it was the legislative purpose in enacting the standard milk ordinance as a State statute to

insure the purity of milk supplied to the inhabitants of the State, it also was the legislative purpose to provide for the free flow of wholesome milk products from one city to another, unburdened by unnecessary duplication of adequate inspection and the erection of prohibitive trade barriers. The court indicated further that one of the purposes of the standard milk ordinance is to restrict the erection of trade barriers that would result from pyramiding of inspection fees and services.

The court pointed out that the record in the case indicated that the Falfurrias inspection was made in accordance with the regulations of the State health officer and is generally accepted by other cities in the State. Further, the Laredo health officer made no claim that he was dissatisfied with the standards or methods of the Falfurrias inspection. Therefore the court stated that since "Any ordinance or statute which prevents any person from engaging in a lawful business cannot be upheld unless protection of life, health or property make it reasonably necessary," the position of the Laredo health authorities, in the light of the record, was "wholly arbitrary."

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*By H. E. Newall, Ph.D., Sc.D., Department of Scientific and Industrial Research, Fuel Research Station, London, England.*

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research, many valuable immunizing agents have been produced.

Elimination of some diseases from our animal population has been so complete that many people have never known or have forgotten that such diseases ever existed; hence, too many of our citizens are somewhat unconcerned regarding veterinary education and research. This is the more regrettable because disease is not static. New problems arise frequently and solutions to these must be sought.

### History of Veterinary Education

Formal veterinary education began in France with the founding of the veterinary college at Lyons in 1761. This important event was precipitated by outbreaks of rinderpest (cattle plague), a serious epizootic disease of ruminants prevalent in Africa and Asia and repeatedly spread to Europe, especially in times of war.

Emergencies created by wars were largely responsible for the founding of a second veterinary college in France in 1764, the renowned *Ecole Nationale Vétérinaire d'Alfort*.

In 1773, the Royal Veterinary College in Copenhagen, Denmark, was established for the purpose of providing protection for the health of the all-important animal industries of that country. Soon after the founding of these three veterinary colleges, others were established throughout Europe and elsewhere.

### Veterinary Education in North America

The first veterinary college in the United States was established in Philadelphia in 1852; the second, in Boston, in 1855, and the third, in New York, in 1857. All these failed in a short time. From 1852 to 1947, 34 veterinary colleges were established and discontinued in the United States and Canada.

The Ontario Veterinary College, affiliated with the University of Toronto, was founded in 1862 and is the first one in North America to have survived to the present.

In 1908, there were 14 private and 7 State veterinary colleges in the United States. By 1918, the number had grown to 23, all offering complete courses in veterinary medicine; 12 of

these were private and 11 were State-supported and affiliated with State colleges and universities. The oldest of the State veterinary colleges in the United States was established at Ames, Iowa, in 1879 as a division of Iowa State College.

A move to raise veterinary educational standards by providing better instruction and more adequate equipment was made in 1908 by Dr. A. D. Melvin, chief of the Bureau of Animal Industry, United States Department of Agriculture, and representatives from 12 veterinary colleges. Strangely enough, the opposition to this effort came chiefly from State schools.

### Effects of Higher Educational Standards

During World War I the Surgeon General of the United States Army contributed to the raising of standards of veterinary education. Up to that time veterinary education varied from 2 to 4 years of college and there were varying entrance requirements.

Thus, because of the demands of the Bureau of Animal Industry and the Medical Corps of the Army, to which the Veterinary Corps was attached, minimum standards for veterinary education were established, namely, high school graduation or its equivalent as qualification for veterinary college admission and 4 years of study in an accredited veterinary college for obtaining the D.V.M. or V.M.D. (University of Pennsylvania) degree.

Because of the elevation of educational standards, the private colleges closed during or soon after the war period. Only the 11 State-supported schools remained. During the decade from 1920 to 1930, enrollment in veterinary colleges in the United States fell to an all-time low. Since then, it has increased rapidly (see chart).

Following World War I a number of veterinarians in the United States became vitally interested in the public health aspects of veterinary medicine and, through teaching and research, contributed much to preventive medicine and public health. Among them were: William H. Feldman, Ward Giltner, William A. Hagan, I. F. Huddleson, K. F. Meyer, Nathan Sinai, and Jacob Traum.

## Graduates from schools of veterinary medicine, 1930-54

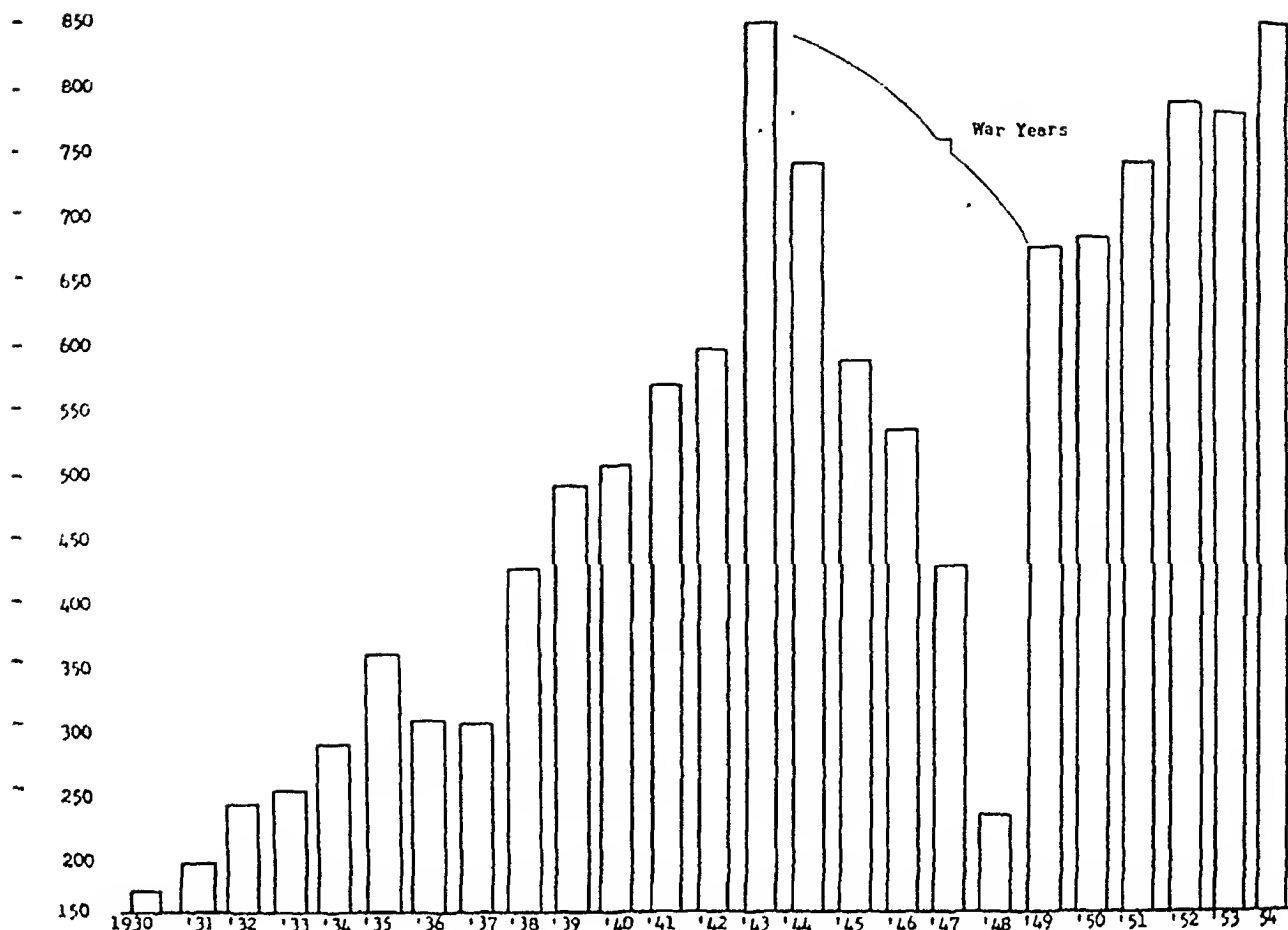


Illustration from the *Journal of the American Veterinary Medical Association*

This graph is based on the schools in the United States only. "War years" refers to the effect of World War II on the number of graduates. In 1943, two classes were graduated in 1 year due to acceleration; in 1948, because of the decrease in demand for veterinarians, only five schools had graduates.

### Increased Demands for Veterinary Education

Since 1945, six new veterinary schools have been established in the United States, partly to meet the demands of returned war veterans for veterinary education and partly because of obvious need for more veterinary services. One of the fields of veterinary service which began to attract more and more veterinarians was what, for want of a better designation, is now called veterinary public health. This field has to do with the maintenance of animal health for the specific purpose of protecting the public from animal diseases transmissible to man. There are now 17 veterinary schools and colleges in the United States and 2 in Canada. These are listed, in the order in which they were founded, on page 665.

In 1954, the veterinary colleges in the United States graduated 799 students with the doctor of veterinary medicine degree (V.M.D., University of Pennsylvania). Ontario Veterinary College graduated 74. The number of graduates from the School of Veterinary Medicine, Province of Quebec (affiliated with the University of Montreal) was 18. The total number of seniors in the 19 veterinary colleges was 904 in 1954. The total enrollment in 1952 was 3,836 and in 1954, 3,883.

### Entrance Requirements and Curriculums

From the time they were founded, three of the older veterinary colleges—Kansas State College, Michigan State College, and Texas



A. & M. College—have offered a 4-year professional curriculum with graduation from an accredited high school as entrance requirements. Iowa State College changed from a 3-year to a 4-year curriculum in 1903. The State College of Washington added a fourth year in 1906. During the period 1913 to 1917, all the rest of the older schools in the United States went over to 4-year curriculums. All the schools established since 1945 began with 4-year professional curriculums.

Entrance requirements have been raised from time to time. In 1931, Iowa State College added 1 year of college work, and soon the other colleges did likewise. Since 1949, all veterinary colleges in the United States have required 2 years of college work of a prescribed nature as minimum preparation for admission. A considerable number enter with the bachelor of science, master of science, or even the doctor of philosophy degree.

The United States Army and the Congress helped to elevate standards of veterinary education to their present level. Shortly after World War II, the initial rank of commissioned veterinary officers in the Army was changed from first to second lieutenant. The principal reason for this was that only 5 years of college work were required for the attainment of the D.V.M. degree. Members of the professions and the veterinary colleges reacted promptly and vigorously by adding a sixth year to the veterinary curriculum. The Congress responded by reestablishing the first lieutenantcy as the initial rank for commissioned veterinary officers in the United States Army.

The Canadian colleges offer 5-year professional curriculums, with graduation from high school (5 years) or its equivalent as a minimum entrance requirement.

The nature of present-day veterinary education is shown in the curriculum on page 666, taken from the catalog of an American college.

It will be noted that much time is devoted to subjects dealing with communicable diseases, infectious and parasitic, with emphasis on preventive medicine. This undoubtedly has been instrumental in the success the veterinary profession has achieved in controlling and eradicating communicable diseases of animals. Inasmuch as veterinarians are trained to approach

## Veterinary Schools and Colleges

- 1862 Ontario Veterinary College, Toronto, Ont., Canada.
- 1879 Division of Veterinary Medicine, Iowa State College of Agriculture and Mechanic Arts.
- 1884 School of Veterinary Medicine, University of Pennsylvania.
- 1885 College of Veterinary Medicine, Ohio State University.
- 1894 School of Veterinary Medicine, Séminaire de St. Hyacinthe, St. Hyacinthe, P. Q., Canada.
- 1896 New York State Veterinary College, Cornell University.
- 1899 College of Veterinary Medicine, State College of Washington.
- 1905 School of Veterinary Medicine, Kansas State College of Agriculture and Applied Science.
- 1907 Division of Veterinary Medicine, Colorado Agricultural and Mechanical College.
- 1907 School of Veterinary Medicine, Alabama Polytechnic Institute.
- 1909 School of Veterinary Medicine, Michigan State College.
- 1916 School of Veterinary Medicine, Agricultural and Mechanical College of Texas.
- 1945 School of Veterinary Medicine, Tuskegee Institute.
- 1946 School of Veterinary Medicine, University of Georgia.
- 1947 School of Veterinary Medicine, University of Minnesota.
- 1948 School of Veterinary Medicine, University of California.
- 1948 College of Veterinary Medicine, University of Illinois.
- 1948 School of Veterinary Medicine, Oklahoma Agricultural and Mechanical College.
- 1949 School of Veterinary Medicine, University of Missouri.

health problems particularly as they apply to the herd rather than to the individual, they are well prepared for work in public health.

Three of the American colleges offer little or no formal class work in the fourth professional year. All, or most, of the fourth year work is done in the clinics where the students are required to make use of what they have learned in their basic science courses, that is, they must apply bacteriology, pathology, parasitology, pharmacology, and so on, in veterinary practice under the supervision of a well-qualified



## Preprofessional Curriculum

### *First Preveterinary Year*

<i>Fall</i>		<i>Winter</i>		<i>Spring</i>	
Communication skills-----	3	Communication skills-----	3	Communication skills-----	3
Natural science-----	4	Natural science-----	4	Natural science-----	4
Inorganic chemistry-----	3	Inorganic chemistry-----	3	Organic chemistry-----	3
Elective-----	3	Mathematics-----	3-4	Trigonometry-----	3
Military science-----	1	Military science-----	1	Elective-----	3
Physical education-----	1	Physical education-----	1	Military science-----	1
	15		15-16	Physical education-----	1
					18

### *Second Preveterinary Year*

Social science-----	4	Social science-----	4	Social science-----	4
Humanities-----	4	Humanities-----	4	Humanities-----	4
Physics-----	3	Physics-----	3	Quantitative analysis-----	3
Zoology-----	3	Zoology-----	3	Physics-----	3
Military science-----	1	Military science-----	1	Military science-----	1
Physical education-----	1	Physical education-----	1	Parliamentary procedures-----	1
	16		16	Physical education-----	1
					17

## Professional Curriculum

### *First Year*

Anatomy, gross and micro- scopic-----	10	Anatomy, gross and micro- scopic-----	10	Anatomy, gross and micro- scopic-----	10
Biochemistry-----	3	Biochemistry (animal)-----	3	Chemistry, blood and urine-----	2
Introduction to dairying-----	3	Farm poultry-----	3	Dairy herd operations-----	4
	16		16		16

### *Second Year*

Livestock management-----	3	Animal husbandry-----	4	Animal pathology, systemic-----	5
General animal pathology-----	3	Animal pathology, systemic and general-----	3	Immunology and serology-----	4
General bacteriology-----	5	Pathogenic bacteriology-----	4	Poisonous plants-----	2
Introduction to parasitology-----	3	Veterinary parasitology-----	3	Dairy cattle nutrition-----	3
Veterinary physiology-----	4	Veterinary physiology-----	4	Veterinary physiology-----	4
	18		18		18

### *Third Year*

Pharmacotherapeutics-----	5	Pharmacotherapeutics-----	5	Veterinary parasitology-----	3
Public health aspects of foods-----	4	Clinic-----	0	Chemotherapeutics-----	3
General surgery-----	3	Small animal medicine-----	4	Poultry diseases-----	4
Obstetrics-----	3	Large animal medicine-----	3	Clinic-----	0
Veterinary medical diagnostics-----	3	Obstetrics-----	3	Small animal medicine-----	4
	18	Small animal surgery-----	3	Large animal medicine-----	3
			18		17

### *Fourth Year*

Clinic-----	4	Clinic-----	4	Public health aspects of meat and meat products-----	3
Large animal surgery-----	5	Radiology-----	3	Clinic-----	4
Infectious diseases-----	3	Large animal surgery-----	3	Infectious diseases-----	3
Jurisprudence and ethics-----	3	Infectious diseases-----	4	Elective <sup>2</sup> -----	6
	15	Elective-----	3		16
			17		

<sup>1</sup> Credits.

<sup>2</sup> Veterinary public health administration.

clinician. In the clinics they will encounter patients in the form of all sorts of livestock, including chickens, ducks, and turkeys, and also pets and wild birds and animals of a considerable variety. This is one of the several features of veterinary medicine which make it a broad and often a very difficult subject.

One veterinary college assigns students for periods of service in slaughterhouses, public health agencies, and on farms of State institutions for experience and training in veterinary public health and general veterinary practice.

The colleges that are not so fortunately situated attempt to provide similar training through field trips to such places under the direction of teachers in the respective fields. Visits to biological and pharmaceutical manufacturing plants are usually included. Some schools require, and all encourage, the students to spend at least one summer vacation with a veterinary practitioner. Others require that the students spend 3 months during the summer in the clinics of the college in lieu of experience with a private practitioner.

One college requires that students who have completed the junior year continue during the summer quarter. Thus, they will be able to complete all professional academic requirements by the end of the winter quarter of their senior year. Each student then is required to spend the spring quarter as an intern under an approved veterinary practitioner. This system may have special merit because students who have completed all their academic work will obviously be better prepared to gain more out of this practical experience than will those who have only 3 years of basic professional education.

Emphasis on social and professional responsibilities is an intrinsic and essential item in education of any sort. Veterinary students should be thoroughly indoctrinated in their various responsibilities to society. Because veterinary education has been made possible by public expense, the public demand on a veterinarian's service in any field in which he may have been trained, seems just. This applies to participation in community public health activities, as well as to any other phase of veterinary practice.

Every veterinary college should have on its staff a veterinarian with graduate training and field experience in public health. Only a person with such training and experience can interpret properly veterinary public health problems and portray adequate, public health practices to the student.

The veterinary research worker must be fully cognizant of the public health aspects of his problems, and, last but not least, the livestock regulatory official, Federal, State, or local, must always be mindful of his public health responsibilities.

### What Is Next in Veterinary Education?

Veterinarians graduated from modern American colleges have received considerable education. The rapid increase in educational requirements makes one wonder what may be the next step in veterinary education. The increasing volume of scientific literature may make it seemingly necessary to lengthen college courses. But students would then spend so much time in school that little would be left for life beyond the university. The minimum total education period for a veterinarian is now 18 years. For those who have earned the B.S. degree before entering the veterinary college, it is 20 years, and for those who have taken graduate work before being admitted to the veterinary college or following graduation with the D.V.M. degree, it may be 26 to 28 or more years. No person can become a practicing veterinarian before he is 24 years old, assuming that he starts primary school at the age of 6.

For veterinarians who expect to become teachers or research workers or both, the Ph.D. degree is now almost a prerequisite. Therefore, these persons may be 28 to 30 years of age, or even older, before they can be considered to have arrived at a fully acceptable educational level. Thus, there will be relatively little time left for a professional career and for raising a family. Furthermore, the cost of such education, like the cost of medical education, has become so great that practicing veterinarians must have substantial resources, or the prospect of a substantial income, in order to enter the profession. This initial overhead has had its impact on the costs of veterinary services.

Much must be done before the best of which we are capable can be achieved in veterinary education. Our goal will not be reached by continuing to add years to the curriculum but rather by better use of the time now allotted to it. Students need a higher degree of motivation and a keener perception of the responsibilities and social implications of professional service. Careful attention to this aspect of education in the home, in the Sunday School, and in grade schools could provide a good foundation for further training in that direction in college.

### Continuing Education

Continuing education is another means through which a solution to our educational problems may be sought. If professional schools can succeed in convincing professional students of the absolute necessity of lifelong study, and if adequate facilities can be established for continuous professional education, we will do better than by further lengthening undergraduate, preprofessional, and professional education.

True, we have postgraduate short courses

now; but, in my opinion, they are not very effective. The professional people who need them most do not bother to attend. Also, too often the courses are conducted in much the same manner as ordinary professional conventions. The first sessions in the morning and after lunch are generally very poorly attended; laboratory work is relatively seldom included, and the only lectures and demonstrations that are usually well attended are those which provide information that will lead to immediate financial returns.

It does not seem unreasonable to suggest that certificates of active and satisfactory participation in at least one refresher course periodically, perhaps even one a year, should be required for uninterrupted license to practice. By active and satisfactory participation is meant actual attendance at lectures and laboratory sessions. Some such system of continuing education, if developed, would go a long way toward assuring continuation of effective veterinary services in the United States.

### REFERENCE

- (1) Hull, T. G.: Diseases transmitted from animals to man. Springfield, Ill., C. C. Thomas, 1941.

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## technical publications

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### National Institute of Mental Health

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*Population studies may serve useful purposes not originally planned, as in this application of data collected on the sample population in the Arsenal health district in Pittsburgh.*

# Participation in the Allegheny County, Pa., Mass Chest X-ray Campaign, 1953

By DONOVAN J. THOMPSON, Ph.D., and SIDNEY PELL, M.B.A.

MASS chest X-ray campaigns have been conducted in many cities in recent years to screen large population groups for previously undetected cases of tuberculosis, neoplasms, cardiovascular disease, and other diseases. Many of these campaigns, owing to skillful organization and tremendous effort, have been able to induce a large proportion of the population to participate in the campaign. Participation rates as high as 75 percent have been reported for some communities (1). However, even in the most successful campaigns, a sizable proportion of the population fails to avail itself of the opportunity to have a chest X-ray.

Although those working directly in the promotion of attendance have impressions as to the differences between the groups that participate and fail to participate, very little quantitative information is currently available on these differences. A description of the existing differ-

ences, between the group which participates and the group which does not, would seem to be useful from several points of view.

First, such knowledge would permit a better judgment of the effectiveness of an X-ray campaign in eliminating undetected cases of tuberculosis and other diseases from the population group surveyed.

Second, pointing up the group differences should assist those responsible for increasing the proportion participating in future campaigns of this type by indicating subgroups requiring special promotional attention.

Finally, students of mass phenomena may find interesting the characteristics of the two groups considered here.

With these considerations in mind, the biostatistics department of the Graduate School of Public Health, University of Pittsburgh, and the Pittsburgh and Allegheny County X-ray Survey Foundation initiated a project designed to compare the participants with the nonparticipants in the Allegheny County X-ray survey. The survey was conducted during April to September 1953.

## Procedures Followed

In connection with a series of community health studies (2, 3) being conducted by the Pittsburgh School of Public Health in the

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*Dr. Thompson, associate professor, department of biostatistics, University of Pittsburgh Graduate School of Public Health, was formerly associated with the statistical laboratory, Iowa State College. Mr. Pell is currently a fellowship student at the graduate school engaged in statistical research for the medical division of E. I. du Pont de Nemours & Co.*

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Much must be done before the best of which we are capable can be achieved in veterinary education. Our goal will not be reached by continuing to add years to the curriculum but rather by better use of the time now allotted to it. Students need a higher degree of motivation and a keener perception of the responsibilities and social implications of professional service. Careful attention to this aspect of education in the home, in the Sunday School, and in grade schools could provide a good foundation for further training in that direction in college.

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tion available, it may be estimated that these adjustments would reduce the county participation rate to 65-67 percent. Furthermore, the net effect of the possible errors of identification in our procedures is undoubtedly in the direction of an undercount of the persons attending. Thus, the apparent discrepancy between Allegheny County and the Arsenal health district in attendance performance, as indicated by the two rates quoted above, is sharply reduced.

All comparisons in the following sections will characterize the group of 3,500 persons X-rayed and the group of 2,474 persons who, although eligible, did not have a chest X-ray. The assumptions underlying the adjustments we have made appear to be reasonable. However, it is felt that considerable deviations from the assumptions would be necessary to vitiate the comparisons of the two groups which follow. Our findings will be presented in four broad categories:

Basic age, sex, and racial differences in the two groups.

Health differences.

Differences in various social characteristics.

A brief examination of the attendance pattern within families.

### Age, Sex, and Racial Differences

Since age, sex, and racial differences in participation are expected a priori and since most of the other findings will be presented in terms of age-sex specific participation rates, we shall examine these characteristics first.

Estimates of the sampling variation of the participation rates quoted are not included in the tables or text to follow. However, the number of cases upon which the rates are based is generally shown, and the extent to which sampling variation may contribute to an observed difference in rates may therefore be assessed.

Table 1 and figure 1 show that the basic age pattern of response to the survey is common to both sexes. It is characterized by a peak among adolescents followed by a sharp drop in the early 20's, a rise to another peak in middle life, and then, after age 55, by a steady decline to a very low response among the elderly. This same pattern will be found in the 1946 Muscogee County, Ga., chest X-ray

survey (4) and the 1950 Los Angeles county-wide survey (5).

Among all the age-sex groups studied, the highest response came from girls between 15 and 19. Below the age of 35, women responded more than men, with the exception of those in the 25 to 29 age group. Their attendance forms an interesting contrast with the consistently higher response of men in all age groups beyond 65. Between 35 and 65, there are differences in response between the sexes, but the differences show no consistent pattern.

Small differences in participation rates were observed for white and nonwhite persons (58.8 and 54.2 percent, respectively), but the number of nonwhite participants in the sample was insufficient to permit age-race comparisons.

### Health Status and Health Awareness

As measures of the current health status of the two groups, data on hospitalization during the year July 1951 to July 1952, for all admissions other than delivery, pregnancy complications, and physical checkups, data on a specific reported condition—heart disease—and data on chronic illness are available from the 1951 household survey for comparison.

A comparison of the participation of persons hospitalized during the year preceding the survey with those not hospitalized reveals a small difference in the overall participation rate between our two groups, 56 percent for X-ray respondents and 59 percent for those who did not respond.

All persons reported to have one or more of the following conditions were classified as chronically ill:

Rheumatism	Hardening of the arteries
Arthritis	Hernia
Heart disease	Loss of use of limbs
High blood pressure	Blindness
Diabetes	Deafness
Kidney trouble	

Persons of both sexes with chronic illness responded to the X-ray invitation at only a slightly lower rate than those not chronically ill, 57 and 59 percent, respectively.

For the single condition, heart disease, the corresponding figures are 55 and 59 percent. The data also indicated that participation of the chronically ill, as compared with those free

of chronic illness, varied with age, but not in a simply described pattern. For the age group 65 and over, the difference in participation was accentuated, 39 percent for the participants and 48 percent for the nonparticipants.

Two additional items related to health awareness were studied, X-ray of the chest during the year preceding the mass campaign and health insurance coverage. Our data indicated that X-ray of the chest in the year before the mass campaign was not a significant factor in relation to participation.

Turning to health insurance coverage, however, we find striking features in the data (fig. 2 and table 2). We see that those who do have health insurance coverage have a markedly higher participation rate than those not having such insurance and that this finding holds true for every age and sex category.

To summarize the findings in this section, we can say that—

Variation in participation by health status is clearly in evidence though, on the whole, not of a striking nature.

As age advances, persons with chronic conditions appear to participate in smaller numbers than those who are free of these illnesses.

Hospitalization in the year preceding the survey is associated with a lower participation rate.

By far the most interesting finding, and one worthy of speculation, is the higher response of persons who have some kind of health insurance.

### Social Characteristics

Our findings on four social characteristics—education, marital status, type of occupation, type of industry in which employed—which may relate to a person's motivation to participate or ability to conveniently get to an X-ray unit, should be particularly interesting to those responsible for promoting mass health campaigns. The isolation and characterization of groups with a noticeably poor attendance record, as was done in the preceding section, also relate to the principal objective of the survey, the detection of unknown cases of tuberculosis.

#### Education

Our inquiry into the variation of attendance with years of formal education showed variation in participation by highest grade of school completed within the different age groups, but no systematic influence of education was discernible. The breakdown by age and educational attainment did reveal, however, the poor attendance among young men over 15 and under 24 who have completed high school (29 percent)

**Table 1. Number and percent X-rayed in sample of persons eligible for X-ray, by age and sex, Arsenal health district, Pittsburgh, 1953**

Age group (years)	Men				Women			
	X-rayed	Not X-rayed	Total	Percent X-rayed	X-rayed	Not X-rayed	Total	Percent X-rayed
15-19	186	100	286	65.0	219	92	311	70.4
20-24	100	186	286	35.0	123	137	260	47.3
25-29	156	118	274	56.9	162	135	297	54.5
30-34	157	118	275	57.1	213	129	342	62.3
35-39	207	102	309	67.0	190	124	314	60.5
40-44	186	93	279	66.7	210	131	341	61.6
45-49	173	80	253	68.4	186	88	274	67.9
50-54	146	73	219	66.7	163	77	240	67.9
55-59	137	81	218	62.8	124	92	216	57.4
60-64	89	88	177	50.3	93	73	166	56.0
65-69	74	56	130	56.9	72	71	143	50.3
70-74	36	39	75	48.0	45	60	105	42.9
75-79	17	26	43	39.5	16	35	51	31.4
80+	8	21	29	27.6	12	49	61	19.7
Total	1,672	1,181	2,853	58.6	1,828	1,293	3,121	58.6

## Participation in X-ray survey, Pittsburgh, 1953.

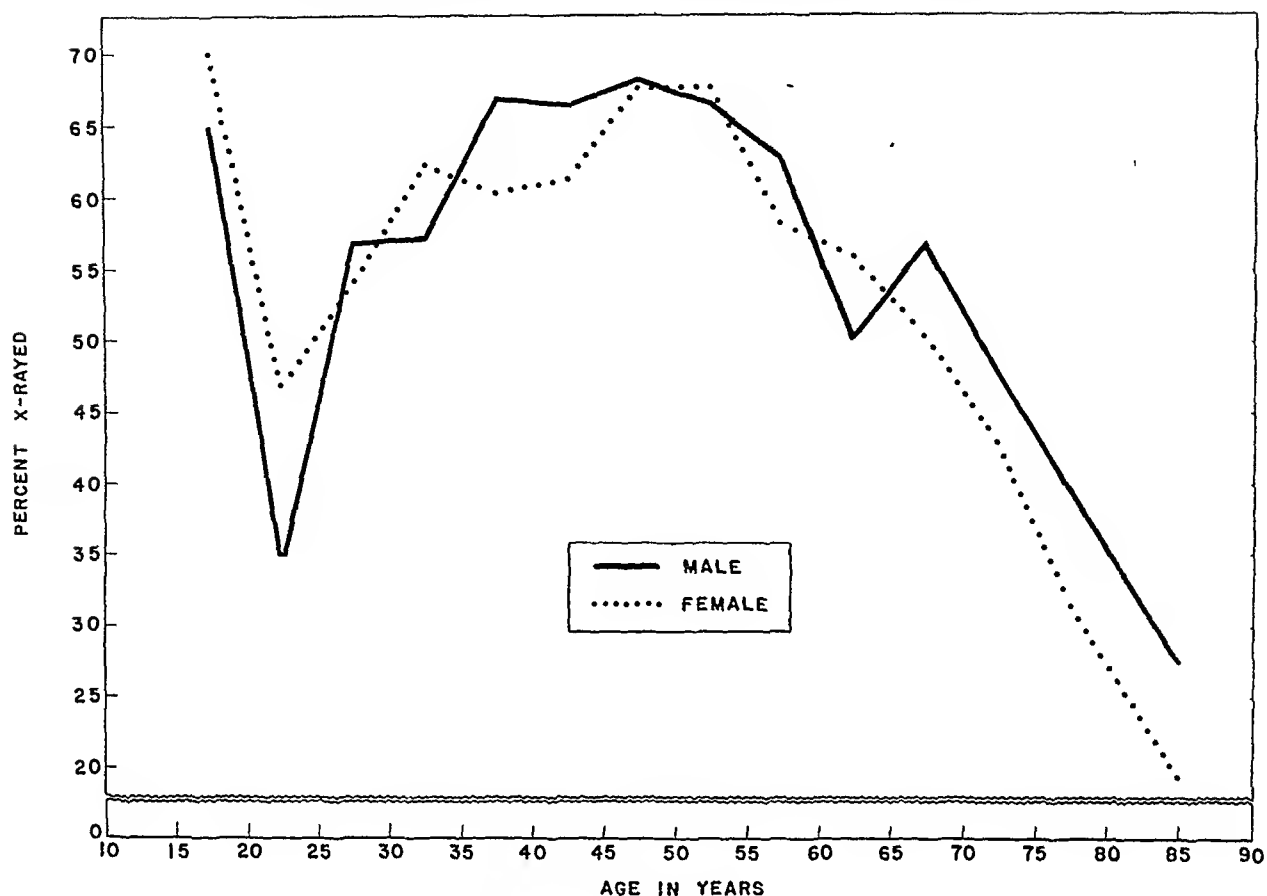


Figure 1. By age and sex.

and the poor attendance of both men and women in the oldest age group who had completed less than the fifth grade (38 and 33 percent, respectively).

### *Marital Status*

Our findings with respect to the relation between attendance and marital status are summarized in figure 3. Although the percentage of married persons who responded to the survey (61 percent) is somewhat greater than that of single persons (54 percent), interpretation of this difference is complicated by the relation between marital status and participation, as found in the age group 15 to 24. The relationship is the reverse of that observed in all the other age-sex categories. From figure 3 it can be seen that the single women in the 15- to 24-age group had the highest percent response of the 16 age-sex-marital status categories (65 percent) and that the married women showed the poorest response (29 percent). The difference between married and single men in this age

category, although similar, is not as striking. For the remaining age-sex categories, married persons consistently attended in greater proportion than single persons.

### *Type of Occupation*

Participation is summarized in table 3 by type of occupation for all ages combined. The highest participation rate was achieved among women classified as students (72 percent). This is largely accounted for by the excellent response of the girls of high school age. If the age group 15-17 is considered, almost all of whose members are high school students, 77 percent of the girls and 69 percent of the boys are estimated to have participated. These percentages point up the success of the X-ray campaign in the secondary schools.

Table 3 also shows that sales workers of both sexes and male clerical workers responded well.

The poorest attendance was found among men and women having "no usual occupa-



# Participation in X-ray survey, Pittsburgh, 1953.

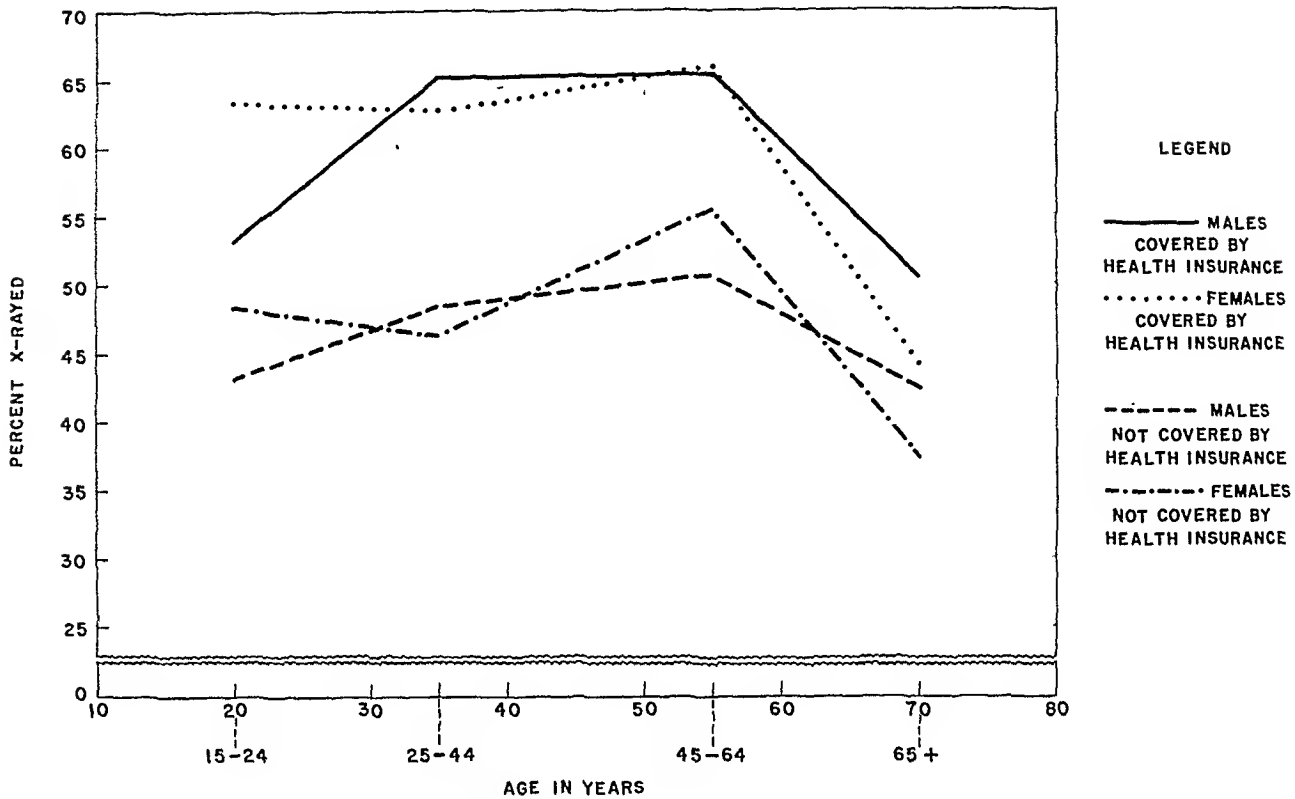


Figure 2. By age, sex, and health insurance coverage.

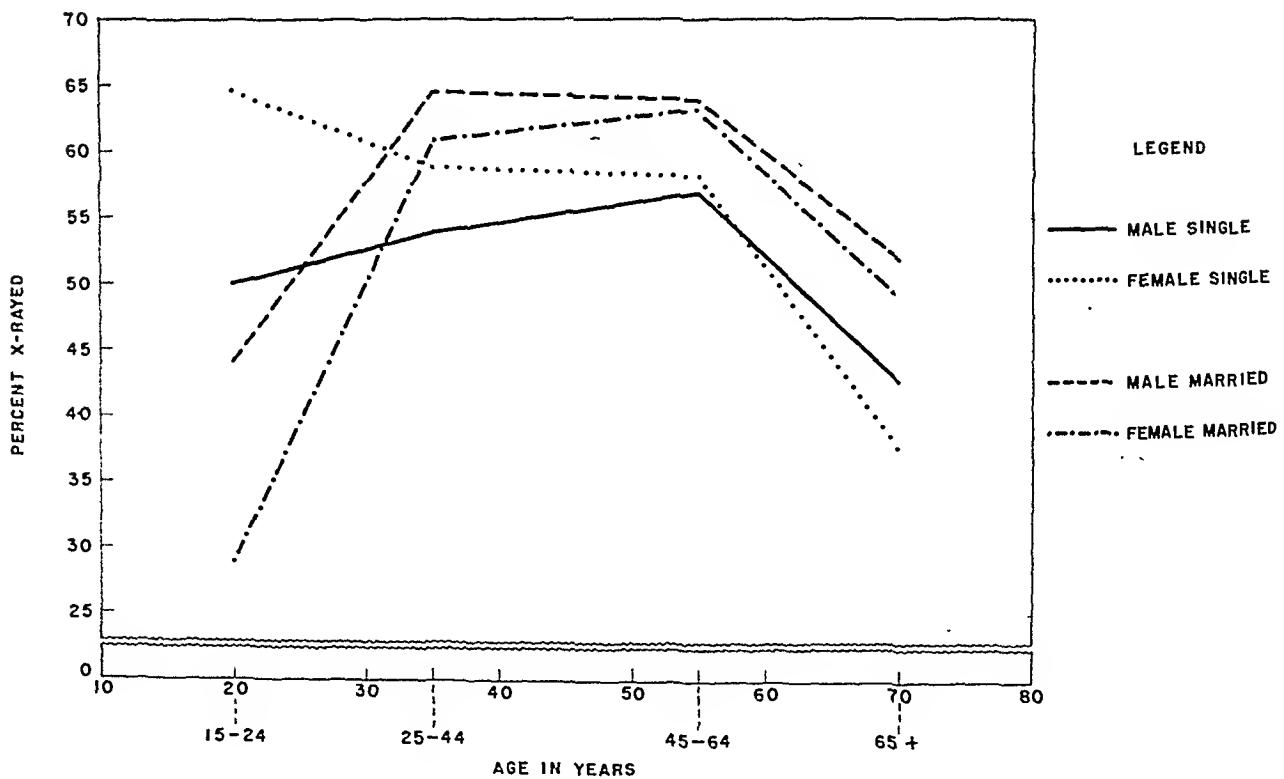


Figure 3. By age, sex, and marital status.

tion." This category consists largely of persons 65 years and over and those who are retired or disabled. The attendance of housewives as a group was somewhat below the average of the entire sample, but an analysis by age indicates that the response was poor among housewives aged 15 to 24 years and over 64. In these age groups, 38 percent of the housewives in the sample were X-rayed, as compared with 62 percent of the housewives between 25 and 64. The comparison of attendance between the white collar and the labor groups indicates that the response was better among white collar workers for both sexes, 62 and 57 percent, respectively.

### *Employment Factors*

If the 13 type-of-industry classifications used in this study are divided into 2 categories, one consisting of the 7 highest in percent of response to the X-ray survey, and the other consisting of the 6 lowest in response, we find the following division and ranking:

#### *Highest*

Students  
Finance, insurance, real estate  
Manufacturing—durable goods  
Wholesale and retail trade  
Manufacturing—nondurable goods  
Transportation, communication, etc.  
Mining and construction

#### *Lowest*

Housewives  
Public administration  
Personal, professional, entertainment services  
Retired  
Unemployed  
Disabled

NOTE. These classifications are based, with some modifications, on the "category of industry" classification used by the Census Bureau. The modifications consist of (a) grouping together "personal services," "professional services," "entertainment services"; (b) separating "students" from "professional services" and "housewives" from "personal services" and (c) adding "retired," "unemployed," and "disabled."

An interesting pattern emerges from this kind of grouping. Each of the seven classifications found to be highest in X-ray attendance represents either a business, industrial, or educational organization; or, we might say that persons in these categories frequently are drawn from large aggregates of persons working under one roof or in a small area. On the other

hand, this is also descriptive of "public administration," which is among the six classifications lowest in response. The other five groups comprise the following: people who do not work (the retired, unemployed, and disabled), self-employed persons (personal, professional, and entertainment services), and housewives.

The higher response of the first category of persons may be explained by one or more of the following reasons:

The effectiveness of a group in stimulating an interest in the X-ray survey.

A planned campaign on the part of the organization, on its own or in cooperation with the Allegheny County X-ray Survey Foundation.

The convenience of the X-ray unit to persons working in these organizations.

The very high response of students (67 percent), discussed previously, is best explained by the effectiveness of the secondary schools in utilizing their resources and position to bring the students, in a sense a captive group, to the X-ray unit. At the other extreme are those who are retired, unemployed, and disabled (47-percent participation for all of these). The poor response of this group may be due to factors relating to age, inaccessibility of the X-ray unit, and the lack of a group stimulus.

By summing up the findings relating participation to the social characteristics of the individual, we can see that the data in this section indicate that participation of married persons was somewhat greater than that of unmarried persons, with the exception of the 15 to 24 age category, where the reverse was true. The response of married women was considerably lower than that of the unmarried women in this group. Apart from the poor response of persons with less than 5 years of schooling, there appeared to be little relationship between the highest grade of school completed and participation in the X-ray survey, so that this set of data would fail to support the hypothesis that people with higher educational attainment are more likely to volunteer for a chest X-ray.

These findings imply that, with the exception of age, the personal characteristics that were studied, such as sex, education, and marital status, are of minor importance in explaining differences in participation in the X-ray survey,

**Table 2. Number and percent X-rayed in sample of persons eligible for X-ray, by age, sex, and health insurance coverage, Arsenal health district, Pittsburgh, 1953**

Age group (years)	Men			Women			Total X-rayed (percent)
	X-rayed	Not X-rayed	Percent X-rayed	X-rayed	Not X-rayed	Percent X-rayed	
	Health insurance coverage						
15-24.....	204	178	53.4	272	155	63.7	58.8
25-44.....	600	319	65.3	665	392	62.9	63.5
45-64.....	464	244	65.5	430	222	66.0	65.7
65 and over.....	77	64	54.6	61	76	44.5	50.0
Total.....	1,345	805	62.6	1,428	845	62.8	62.7
	No coverage						
15-24.....	82	108	43.2	70	74	48.6	46.0
25-44.....	106	112	48.6	110	127	46.4	47.5
45-64.....	81	78	50.9	136	108	55.7	53.8
65 and over.....	58	78	42.6	84	139	37.7	39.6
Total.....	327	376	46.5	400	448	47.2	46.9
Grand total.....	1,672	1,181	58.6	1,828	1,293	58.6	58.6

and that the differences that do exist are more closely associated with occupational and employment characteristics. Among all of the occupational groups, the best response was obtained from persons of high school age. It was also noted that a better participation record was made by persons who performed their occupations in large organizations than by housewives, or by those who were self-employed, or unemployed for one reason or another. It appears, therefore, that we must look to the group rather than to the individual to understand the participation patterns observed in the survey.

#### Family Unit Characteristics

In the preceding sections our findings have been presented in terms of characteristics of the individual as they relate to his attendance performance. We now turn to a brief examination of X-ray attendance by members of the same household. Our definition of household is the same as that employed by the Bureau of the Census, which principally requires that the group of persons constituting a household live under a common roof and share common eating facilities.

A striking variation in household attendance patterns, according to whether or not the head of the household was X-rayed, may be observed in tables 4 and 5. Here is one of the most interesting findings of the study: There appears to be a marked tendency for persons of the same household to react in a similar fashion to the X-ray invitation.

For households composed of only two persons it can be seen that in 65 percent of the homes (table 4) when the household head had a chest X-ray so did the other member of his household; on the other hand, if he did not take part in the campaign, the other person attended in only 40 percent of the cases.

The manner in which this tendency manifests itself for the other three sizes of households covered may also be observed in the table.

There are many possible explanations for the observed relation, and it should be mentioned that our choice to present this finding in terms of the attendance of the head of the household was principally one of convenience.

It may also be observed that this comparison by size of household is a gross comparison: Age, sex, race, occupation, and similar characteristics of the household members are in no way

standardized. From some points of view, this makes this finding even more striking.

In table 5 we have a similar comparison where the household units have been standardized to the extent that they have been grouped by size as measured in terms of number of persons 15 years of age and older (the group eligible for X-ray). The attendance pattern of nonheads of households has changed from that observed in table 4. However, the positive association between the attendance of the head and the attendance of greater numbers of other members of his household is perhaps even more evident, now that the children have been removed from the comparison. It is noteworthy that evidence of intrafamily influence was also found in the Muscogee County, Ga., chest X-ray survey of 1946 (4).

### Social Welfare Status

Finally, from a study (6) of the relation between health status and social welfare status we have a classification of our sample households as measured by whether or not the household is known to the Pittsburgh Social Service Agencies through requests by one or more members of the household for assistance from the agencies. The proportion X-rayed (55 percent) in households with active cases, as of

July-December 1951, is somewhat lower than the corresponding proportion (61 percent) in households not known to the agencies, particularly for women (53 and 61 percent). However, the response among the "needy and troubled" is not alarmingly low.

### Discussion

The many factors that may be at work simultaneously to impel a person to volunteer for an X-ray pose a problem in interpreting the data. If the data indicate that a certain characteristic is associated with X-ray attendance, an interpretation of that relationship is difficult to make because the observed association may merely be a manifestation of one or more significant, but unknown, underlying factors. For this reason, the principal objective of the study has been largely restricted to a report of facts about the two groups.

However, several tentative conclusions concerning the factors that influence attendance seem warranted from an evaluation of all the findings. First, although a number of differences have been noted between the group that participated and the group that failed to respond, the differences generally are not large. Racial, sex, education, health and welfare status differences in the two groups, in general, are

**Table 3. Number and percent X-rayed in sample of persons eligible for X-ray, by sex and occupation, Arsenal health district, Pittsburgh, 1953**

Occupation	Men			Women			Total X-rayed (percent)
	X-rayed	Not X-rayed	Percent X-rayed	X-rayed	Not X-rayed	Percent X-rayed	
Professional and technical workers.....	88	65	57.5	41	29	58.6	57.8
Managers, officials, proprietors.....	133	78	63.0	15	13	53.6	61.9
Clerical and kindred workers.....	139	75	65.0	186	127	59.4	61.7
Sales workers.....	82	41	66.7	48	21	69.6	67.7
Craftsmen and foremen.....	365	266	57.8				57.8
Operatives and kindred workers.....	287	196	59.4	55	46	54.5	58.6
Private household and service workers.....	86	64	57.3	94	68	58.0	57.7
Laborers.....	177	149	54.3				54.3
No usual occupation.....	74	86	46.3	32	43	42.7	45.1
Housewives.....				1,091	819	57.1	57.1
Students.....	204	122	62.6	236	93	71.7	67.2
Others.....	37	39	48.7	30	34	46.9	47.9
Total.....	1,672	1,181	58.6	1,828	1,293	58.6	58.6

not striking. Even with respect to age, for which the observed differences have been discussed earlier, the participation rate in the age category 65 and over is estimated to be 44 percent, as compared with 59 percent for all ages.

These facts would seem to indicate that the organizational and promotional activity of the Allegheny chest X-ray survey had a very broad base and motivated large numbers of persons in all walks and stations of life. The data presented here do not seem to indicate that the factors of training, education, and conditioning, which might be thought to stimulate awareness of the importance of periodic health examinations, were important in increasing X-ray attendance. There is little evidence that a greater amount of education is associated with a higher rate of participation. Rather than increased attendance with advancing age the data showed a decline in participation as age increases beyond the middle years. Furthermore, there is little evidence in the data to suggest that a chronic illness or a recent hospitalization was an important factor in influencing attendance.

Although the factors described in the preceding paragraph apparently are not strongly associated with the decision on the part of a per-

son to divert himself from his normal daily habits and step into an X-ray booth, there is evidence in this study of the effect of motivation of the individual through the group or groups of which he is a member. It was found that persons who were self-employed, or not employed, had a lower attendance than those associated with insurance and real estate firms, schools, and industrial and commercial establishments, where social pressures and concerted effort on the part of the organization might be easily applied.

A similar impetus may have been responsible for the observation that in households where the head participated in the X-ray campaign, larger numbers of other household members also participated than where the head failed to attend. Another piece of evidence that fits into this pattern is the finding that persons covered by health insurance participated in larger numbers than those not so covered. Since health insurance coverage is positively associated with working in large establishments, through the high prevalence of group plan insurance in these concerns, this finding is consistent with the hypothesis advanced.

The reasons for the positive association be-

**Table 4. Percent response to X-ray invitation, by household size and X-ray status of all household members, Arsenal health district sample, Pittsburgh, 1953**

Size of household	Number of households	Percent of households with indicated number of nonheads X-rayed				
		0	1	2	3	4 or more
		Household head X-rayed				
1.....	66					
2.....	271	35	65			
3.....	308	20	50	30		
4.....	297	15	51	25	9	
5 or more.....	337	17	34	25	15	9
Total.....	1,279					
		Household head not X-rayed				
1.....	58					
2.....	234	60	40			
3.....	239	45	44	11		
4.....	171	44	35	16	5	
5 or more.....	211	27	30	28	13	2
Total.....	913					

**Table 5. Percent response to X-ray invitation, by household size, as measured in terms of eligibility for X-ray, and by X-ray status of all household members, Arsenal health district sample, Pittsburgh, 1953**

Size of household	Number of households	Percent of households with indicated number of nonheads X-rayed				
		0	1	2	3	4 or more
		Household head X-rayed				
1.....	69					
2.....	586	31	69			
3.....	319	14	37	49		
4.....	178	7	28	39	26	
5 or more.....	127	16	16	20	24	24
Total.....	1,279					
		Household head not X-rayed				
1.....	60					
2.....	452	61	39			
3.....	192	25	50	25		
4.....	105	43	26	20	11	
5 or more.....	104	11	23	39	22	5
Total.....	913					

tween participation and group membership cannot, of course, be determined from the data at hand. Another interpretation of the higher participation rates in the groups mentioned is that of accessibility of the X-ray unit to the person whose participation was sought. The higher rates in the groups of school children, industrial and commercial establishments, and other establishments where large numbers of persons assemble in pursuance of daily tasks may be simply a reflection of success in locating an X-ray unit in or near the premises so that difficulty in seeking the X-ray was minimized.

Although it seems doubtful that mass X-ray campaigns for the detection of tuberculosis, such as the type of campaign described here, will be undertaken in the future should the present downward trends in incidence of tuberculosis continue, this discussion cannot properly be ended without commenting briefly on what the findings indicate with respect to detecting new cases of tuberculosis in the community. Since the tuberculosis problem is becoming more and more a problem of an aging population, the falling off in participation after the middle years to low participation among elderly persons (table 1) would indicate that

the results would be poor in these age groups.

Several other groups with low participation rates were isolated in our study. Those that are particularly interesting in this connection are (a) married women in the age group 15 to 24 and (b) persons retired, disabled, or unemployed for other reasons. Both these groups merit special attention when survey groups are considering ways of detecting new cases of tuberculosis. The first group contains a high proportion of young mothers, and the second contains the elderly, both groups that should be important targets for case-finding activities.

### Summary

At the end of a campaign designed to motivate a large population group to participate in a community venture, such as a chest X-ray survey, the question is always raised as to the characteristics that distinguish the group which responds from the group which fails to respond. During the Allegheny County X-ray survey conducted from April to September 1953 a unique opportunity for studying these group differences was available to the Graduate School of Public Health, University of Pitts-

burgh. An equiprobability sample of 5,974 persons, 15 years of age and older, representing a population group of some 80,000 persons residing in the Arsenal health district of Pittsburgh, provided information on many characteristics of both the group which participated in the survey and the group which failed to participate. We have presented the findings of the inquiry into the reasons for these differences.

From an overall point of view the differences between the two groups, while sizable for certain characteristics, are generally not extremely large. Some of the differences that do exist, however, suggest certain factors that may be related to participation in the X-ray survey. Comparisons between the participants yielded the following important findings:

In examining X-ray response according to age, it was found that comparatively high participation rates occurred among adolescents and middle-aged individuals. Relatively poor responses were noted among persons in their early 20's and those 65 years and older.

Among persons 25 years or older, the response of married persons in each age group studied was greater than that of the unmarried.

The participation rate of students of high school age was the highest among all occupational categories studied. The data also indicated a tendency of persons who worked as part of a group to have a higher response rate than those who were self-employed or not employed.

Persons who were covered by some form of health insurance showed a considerably higher rate of participation than those not covered. This finding was true of each age-sex category.

Evidence of forces within the family unit to

stimulate participation in the X-ray survey was demonstrated by a comparison of attendance in households according to whether or not the head of the household volunteered for an X-ray. The pattern of participation in households where the head did attend clearly indicated a greater response in these households than in those where the head did not participate.

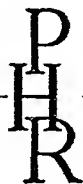
Little or no association was found between response to the X-ray survey and health status, education, sex, race, or social welfare status.

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*Tabulations omitted from this report are available from the authors.*

#### REFERENCES

- (1) Pittsburgh and Allegheny County [Pa.] X-ray Survey Foundation: Preliminary statistical report. Pittsburgh, The Foundation, 1953, p. 2.
- (2) Ciocco, A.: Family studies in Pittsburgh, Pa. In Research in public health. Papers presented at the 1951 annual conference of the Milbank Memorial Fund. New York, The Fund, 1952, pp. 248-254.
- (3) Horvitz, D. G.: Sampling and field procedures of the Pittsburgh morbidity survey. Pub. Health Rep. 67: 1003-1012, October 1952.
- (4) Burke, M. H., Schenck, H. C., and Thrash, J. A.: Tuberculosis studies in Muscogee County, Ga. II. X-ray findings in a community-wide survey and its coverage as determined by a population census. Pub. Health Rep. 64: 263-290, March 4, 1949.
- (5) Drolet, G. J.: Los Angeles countywide chest X-ray survey of 1950. Los Angeles, Tuberculosis Control Foundation, 1953. Appendix table 7.
- (6) Ciocco, A., Densen, P. M., and Horvitz, D. G.: On the association between health and social problems in the population. Milbank Mem. Fund Quart. 31: 265-290, July 1953.



# Tuberculosis X-Ray Case-Finding Activities United States, 1953

STATE health departments reported that more than 15½ million persons were X-rayed in tuberculosis case-finding projects in the continental United States during the calendar year 1953. This number, which exceeds the number X-rayed in case-finding activities in 1952 by 2 million, is the largest ever reported. Reports were received from all States in 1953.

In Alaska, Hawaii, and Puerto Rico, a half million persons were X-rayed, according to the reports received from these Territories. The State and Territorial reports generally did not include the X-rays taken by Federal agencies, except those taken by the Public Health Service. When the number of X-rays taken by Federal agencies is added to the 16 million reported by the States and Territories, the total number of persons X-rayed in the United States and Territories during 1953 is more than 21 million.

Data on X-ray case-finding activities for each State and Territory, exclusive of Federal agency data, are given in the accompanying table. Although there was an increase of 2 million in the number of X-rays in 1953, not every State reported an increase. Eighteen States, the District of Columbia, and Hawaii reported decreases, and one State, Nevada, reported no X-rays taken in 1952 or in 1953.

Five States—California, Illinois, Michigan, Pennsylvania, and Washington—together reported an increase of approximately 2 million X-rays. A communitywide chest X-ray survey in Pittsburgh and Allegheny County, Pa.,

during which 881,646 X-rays were taken, helped Pennsylvania report the largest number of X-rays taken by any of the States and Territories during 1953.

It is interesting to observe how the increase in the number of X-rays taken affected the coverage of the population. For the continental United States, 9.8 percent of the population were reported examined in tuberculosis X-ray case-finding activities in 1953 as compared with 8.6 percent in 1952; for the United States and Territories, 9.9 percent were reported examined in 1953 as compared with 8.7 percent in 1952. When the number of X-rays taken by Federal agencies is added to the number reported by State and Territorial health departments, 1 out of every 8 persons in the United States had an X-ray examination for tuberculosis during 1953. The percentage of the population examined in tuberculosis X-ray case-finding activities varied from a high of 54.2 percent in Delaware, which had a statewide mass X-ray survey during the year, to 1.1 percent in Vermont and 0 percent in Nevada.

Of the total new cases of tuberculosis reported during the year, 32 percent were first discovered as a result of X-ray case-finding activities in 1953 as compared to 28 percent in 1952. Newly reported cases first discovered as a result of X-ray case-finding activities may include both group A cases (active and probably active cases) and group B cases (arrested, inactive, and other reportable cases); therefore, the percentage is based on the total newly reported cases (group A plus group B) for each State and Territory. For the continental United States, the increase in the percentage of population covered by X-ray case finding brought a proportionate increase in the percentage of the total newly reported cases first discovered as the result of X-ray case-finding activities. In fact, the number of new cases found per 1,000 X-rays in 1953 was about the same as the number in 1952, showing that the yield was not adversely affected by the increase in coverage.

As shown in the accompanying table, the per-

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*This report was prepared by the Tuberculosis Program, Division of Special Health Services, Bureau of States Services, Public Health Service.*

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**Tuberculosis case-finding X-rays taken and number of new cases found, United States and Territories,  
calendar year 1953**

State or Territory	X-rays taken		New tuberculosis cases resulting from X-ray screening activities	
	Number	Percent of population X-rayed	Number <sup>1</sup>	Percent of total newly reported cases
Alabama.....	158,259	5.1	813	38.2
Arizona.....	63,653	6.8	102	6.7
Arkansas.....	178,925	9.4	372	24.2
California.....	1,201,834	9.9	<sup>2</sup> 1,003	<sup>2</sup> 12.4
Colorado.....	136,245	9.6	298	21.2
Connecticut.....	131,602	6.1	( <sup>3</sup> )	-----
Delaware.....	194,060	54.2	45	19.4
District of Columbia.....	163,543	19.4	( <sup>3</sup> )	-----
Florida.....	382,304	11.4	188	7.8
Georgia.....	245,036	6.8	<sup>2</sup> 523	<sup>2</sup> 25.1
Idaho.....	58,322	9.7	42	24.9
Illinois.....	1,371,984	15.2	<sup>2</sup> 914	<sup>2</sup> 14.2
Indiana.....	357,173	8.6	( <sup>3</sup> )	-----
Iowa.....	255,661	9.8	229	30.6
Kansas.....	150,902	7.5	64	16.6
Kentucky.....	293,885	9.9	1,436	50.7
Louisiana.....	315,024	10.9	<sup>2</sup> 621	<sup>2</sup> 30.5
Maine.....	55,129	6.0	57	14.4
Maryland.....	258,548	10.2	184	8.4
Massachusetts.....	222,387	4.5	<sup>4</sup> 933	<sup>4</sup> 65.0
Michigan.....	752,454	11.0	960	17.0
Minnesota.....	307,653	10.1	<sup>2</sup> 440	<sup>2</sup> 21.2
Mississippi.....	208,646	9.6	501	40.3
Missouri.....	264,278	6.5	572	22.8
Montana.....	100,655	16.4	121	35.7
Nebraska.....	114,916	8.5	28	10.4
Nevada.....	0	0	-----	-----
New Hampshire.....	28,327	5.4	47	31.1
New Jersey.....	141,984	2.8	<sup>2</sup> 184	<sup>2</sup> 4.4
New Mexico.....	39,893	5.3	55	5.3
New York.....	992,351	6.5	<sup>5</sup> 391	<sup>5</sup> 9.7

centage of total new cases first discovered as a result of X-ray case-finding activities varies widely among the States. It ranged from a high of 77 percent for Alaska to 5 percent for New Mexico. The standards used in screening suspects, the characteristics of the population X-rayed, what constitutes a reportable case of tuberculosis in each State, as well as the prevalence of tuberculosis in each State, all contribute to the differences observed among the States.

The percentage of newly reported cases first discovered as a result of X-ray case finding is not directly related to the number of X-rays taken during 1953 because the number of new cases reported as a result of X-ray case finding is not restricted to those persons whose screening films were taken in 1953. Some of the cases

reported in 1953 were reported as a result of screening films taken in 1952, and cases among persons having screening films taken in 1953, especially during the later months, will be reported in 1954.

The States do not have equally efficient procedures for separating the new cases discovered by X-ray screening from cases discovered by other means; consequently, the data reported by some States may be considered as the minimum numbers of new cases found by X-ray case finding. Even with this restriction, however, almost one-third of the new tuberculosis cases reported in the United States during the calendar year 1953 were reported as a result of screening one-eighth of the population. It is possible that many X-rays were taken in segments of the population having high preva-

**Tuberculosis case-finding X-rays taken and number of new cases found, United States and Territories,  
calendar year 1953—Continued**

State or Territory	X-rays taken		New tuberculosis cases resulting from X-ray screening activities	
	Number	Percent of population X-rayed	Number <sup>1</sup>	Percent of total newly reported cases
North Carolina.....	592,984	14.1	( <sup>3</sup> )	-----
North Dakota.....	80,493	13.0	29	13.6
Ohio.....	<sup>2</sup> 879,039	10.5	3,589	54.1
Oklahoma.....	216,344	9.6	464	26.5
Oregon.....	202,079	12.6	192	29.3
Pennsylvania.....	1,684,647	15.8	( <sup>3</sup> )	-----
Rhode Island.....	84,086	10.3	58	14.5
South Carolina.....	135,140	6.2	191	16.2
South Dakota.....	65,573	10.0	23	10.3
Tennessee.....	542,091	16.3	2,441	71.8
Texas.....	447,106	5.4	( <sup>3</sup> )	-----
Utah.....	46,334	6.3	15	10.2
Vermont.....	4,271	1.1	95	59.4
Virginia.....	421,497	11.9	( <sup>3</sup> )	-----
Washington.....	585,274	23.6	( <sup>3</sup> )	-----
West Virginia.....	77,748	4.0	278	23.9
Wisconsin.....	290,339	8.3	298	20.8
Wyoming.....	45,197	14.8	23	22.5
Total continental United States.....	15,545,875	9.8	-----	<sup>6</sup> 31.9
Alaska.....	20,211	9.9	597	77.0
Hawaii.....	117,665	22.5	236	40.3
Puerto Rico.....	346,811	15.6	1,389	26.5
United States and Territories.....	16,030,562	9.9	-----	<sup>6</sup> 32.1

<sup>1</sup> May include group B cases; for further qualification, see text.

<sup>2</sup> Specifically reported as incomplete.

<sup>3</sup> Data not available.

<sup>4</sup> Based on data from Massachusetts exclusive of Boston.

<sup>5</sup> Based on data

from New York State exclusive of New York City and specifically reported as incomplete.

<sup>6</sup> Rate for areas submitting data.

SOURCE: Annual Tuberculosis Reports, form PHS-1393.

lence rates, but continued examination of these high-prevalence groups is needed to eliminate these reservoirs of infection. It is apparent that X-ray screening for tuberculosis is a pro-

ductive case-finding device and that continued, conscientious use of this device can do much to bring under supervision the large number of unknown cases of tuberculosis in this country.

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# Tuberculosis Case Finding in a County Jail

By NORTON G. CHAUCER, M.D., M.P.H.

**S**TUDIES suggest that X-raying inmates of county jails is productive case finding at its best (1). Hence a small-film chest X-ray survey at the Hartford (Conn.) County Jail was made in June 1953, all within a few days. A portable 70-mm. PFX unit was set up in a central portion of the jail. All inmates and jail personnel were screened by the local health department, the sheriff and his personnel co-operating.

## Results of Survey

No cases of active disease were found among the jailers. Twenty cases of active tuberculosis, 21 of inactive, and 49 cases of other conditions were revealed among the inmates of the jail.

Active cases were defined as those in which subsequent large films, sputum testing, and other means verified the diagnosis of active tuberculosis and sanatorium care was recommended. With one exception these 20 active cases were newly reported. All were men. Six of the men had minimal tuberculosis, 9 moderate, and 5 far advanced. Together they represent 3 percent of the total number surveyed, 663.

Of the 21 inactive cases, 13 men had minimal tuberculosis, 6 moderate, and 2 far advanced. Four cardiac and 2 tumor cases were among the 49 other findings.

Three men out of 100 jail inmates were

found to have active tuberculosis requiring hospitalization. For comparison the figure for active tuberculosis found in current chest surveys of industrial populations by the Hartford Health Department is 0.15 percent—less than 2 cases per 1,000 individuals filmed. For all persons X-rayed (self, doctor, high school, and industry referral), the rate of active cases of tuberculosis found in the survey clinic for 1953 was 0.35 percent—less than 4 cases per 1,000 persons X-rayed.

## Continuous Survey

Since it appeared that the jail population had an inordinately high prevalence of active tuberculosis at the time of the 1953 survey, it was decided to begin a regular program of X-raying all new jail admissions.

A 15-milliamper large film unit was furnished by the local tuberculosis society. In February 1954, X-rays were taken weekly on most of the prisoners admitted during the previous week. An average of 30 films were taken 1 day per week thereafter. The results of this continuous survey of jail inmates were comparable to those of the 1953 survey. To date 1,001 prisoners have been screened by X-ray within one week of admission to jail. Twenty-nine have been found to have active tuberculosis. Some of these were new cases; some were showing an increase of disease previously known but considered arrested; and others had been lost to followup. Three additional cases of active tuberculosis found in jail admissions during this time had been known but lost to the health de-

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*Dr. Chaucer is deputy director of health in the Hartford Health Department, Hartford, Conn.*

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**Active tuberculosis cases found among 1,001  
X-rayed jail inmates, February–September  
1954**

Admission status	Cases		Stage of disease		
	Num- ber	Per- cent	Mini- mal	Mod- erate	Far ad- vanced
New.....	17	1.7	3	8	6
Known:					
Reactivated.....	2	.2	1	1	0
Active, but lost to followup--	10	1.0	1	6	3
Total.....	29	2.9	5	15	9

partment. So here again we found approximately 3 cases of active disease per 100 persons filmed.

These results have convinced us that in this particular urban area the largest reservoir of active cases of tuberculosis is to be found in the group of minor offenders committed each day to the county jail. Although the jail also houses prisoners bound over for trial in higher courts, with one exception the cases of active tuberculosis have been found among the short-sentenced group.

The sheriff estimates that 85 percent of the inmates of Hartford County jail are there because of offenses associated with alcoholism. It has been possible through the police court judges to arrange for speedy transfer of these prisoners to State sanatoriums. This would not have been possible had their offenses been of a more serious nature as there are no locked wards in these institutions. This raises the question of whether these men can be kept under treatment long enough to effect a cure.

This experience emphasizes the changing pattern of tuberculosis spread. With modern high levels of personal and community sanitation lived up to and with good nutrition, the epidemic spread of tuberculosis is unlikely.

#### Followup

A 15-month followup of the 20 cases of active tuberculosis found in the June 1953 survey shows:

3 remained in sanatoriums until case was arrested.

13 are still in sanatoriums.

3 are out from under sanatorium care against medical advice.

1 is lost to followup by moving out of the State.

Of all these persons with active tuberculosis discovered in the Hartford County jail, 5 left the sanatorium against advice once during this 15-month period. Two left twice, and 2 left more than twice. One of these was rehospitalized 4 times in this period of little more than a year. Of the 19 cases found and accounted for, all have averaged more than 8 months of sanatorium treatment.

In these figures is buried a large amount of work—investigation to find the patient after his signout; discussion to persuade him to reenter the hospital; and transfer, discharge, and re-admission notes made by the sanatorium authorities. That such effort is worth while appears in the combined figures of those arrested or still under treatment—16 of the 19 original cases followed.

#### Summary

Through chest X-rays taken on all inmates of the Hartford (Conn.) County Jail in June 1953, 20 cases of active tuberculosis were discovered, a case-finding rate of 3 per 100. Weekly X-raying of newly admitted prisoners from February 1954 through September 1954 brought to light 29 additional cases of active tuberculosis. A 15-month followup report on 19 of the 20 original cases showed that at the end of the period all but 3 were under sanatorium care or had been discharged as arrested cases. It is suggested that, in spite of present high standards of community health, the county jails remain an important reservoir of active tuberculosis.

#### REFERENCE

- (1) Northrop, C.: The practical management of the recalcitrant tuberculosis patient. Pub. Health Rep. 67: 894-898. Sept. 1952.

for the American Board of Pathology to recommend that a candidate carry out one or more experimental problems during his residency training.

### Opportunity for Active Research

The old method of training men in pathology in the intellectual atmosphere of the university covering a period of 6 to 10 years was ideal in many respects, but it is gradually being abandoned owing to economic pressures. In that situation, a man could devote a good part of his time to teaching, autopsies, and surgical and clinical pathology. During the summer months he would have leisure to carry on an active program in research with no responsibility for teaching students. If a system of training of this type could be established in a certain number of pathology departments and universities and subsidized so that the candidate would have no financial worries, it would increase the number of experimental pathologists.

Organizations should provide funds for research grants on the basis of long-term personal income as well as on readily available money for facilities and conference travel expenses. The symposium suggested for the Public Health Service principal responsibility among government agencies in providing support for developing research in pathology. When the permanent funds of an institution are not adequate, the granting agencies should permit their grant money to be converted at once to rela-

tively firm financial sources to be utilized more freely at the judgment of the pathologist in charge of the research.

### The Major Recommendations

Career investigators in pathology should be given funds for 5 years or longer for research, salary, training, and travel to scientific meetings. The research pathologist should be given long-term training in several disciplines such as cytochemistry and electron microscopy to emphasize the importance of the dynamics of the pathologic process. Graduate courses should be developed in departments of pathology in schools of veterinary medicine to provide training in comparative pathology in respect to experimental animal research.

It was strongly recommended that the ad hoc committee of this symposium in collaboration with the American Board of Pathology work with other specialty boards to develop a pattern of research training in the laboratory for the residents of the clinical services to secure better training and establish research in the general hospitals. The ad hoc committee, of which Dr. Robert E. Stowell of the University of Kansas is currently chairman, was charged with the responsibility of implementing the recommendations of this symposium. The committee has already progressed toward bringing these recommendations to the attention of pathologists and administrators, and is carrying the problem to the public by various means.



| Three potentially pathogenic fungi are reported in polluted water in southwestern Ohio.

# Isolation of Potentially Pathogenic Fungi From Polluted Water and Sewage

By WILLIAM BRIDGE COOKE, Ph.D., and PAUL KABLER, M.D., Ph.D.

DURING the last several years, increasing evidence has accumulated that fungi potentially pathogenic for man can be isolated from the environment. Ajello (1, in tabular summary; and 2), Cooke (3), and Grayston and Furcolow (4) have reported the finding of fungi which are considered etiological agents of some of the deep-seated and the superficial mycoses of man, in habitats such as natural and cultivated soils; wild animal burrows; soils under nesting places of birds and fowl; undisturbed portions of buildings, such as attics, basements, and belfries where birds and animals nest or roost; and hollow trees.

A habitat type recently tapped for the presence of fungi, and which also is relatively rich in nitrogenous compounds, is sewage and polluted water. Here certain fungi occur, partly as members of natural communities, partly introduced by "runoff" or through excrements which form a large part of the solids of the habitat.

The presence of pathogenic fungi in any

habitat does not necessarily imply the widespread occurrence of the disease caused by them, nor does it imply the presence of a case of illness attributable to the disease in the immediate vicinity. In fact, records of diseases caused by the fungi to be discussed below are rare in the southern Ohio area where samples were obtained.

In addition to *Allescheria boydii*, which has been discussed by Ajello (1), *Aspergillus fumigatus* and *Geotrichum candidum* have been isolated repeatedly. *A. fumigatus* is the etiological agent of one type of aspergillosis, a disease which has been described and illustrated in the textbook by Conant and his colleagues (5). Reports in the literature dealing with soil molds, fungus contaminants, and cellulose deterioration indicate that this species is a very common fungus occurring throughout the world (6, 7). It appears to be more common in warmer and more humid areas. Thus, it is not surprising that it would be a common mold associated with polluted streams and sewage disposal plants, where temperatures are usually higher than those of other parts of the environment, especially in colder months.

The pulmonary disease geotrichosis has been described and illustrated by Conant and his co-workers (5). *G. candidum*, also known as *Oidium lactis* or *Oospora lactis*, is the etiolog-

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ical agent of this disease (5, 8-10). It is also frequently isolated from sputum and other excretions from patients with other diseases, especially of the respiratory tract. The organism is one of the commonest fungi associated with the activities of man. It is the principal contaminant of dairies, is commonly associated with moldy milk and cottage cheese and other milk products, and may be one of the organisms involved in the manufacture of certain types of

cheese. It is a common laboratory contaminant and is frequently found in soils.

### Experimental Material and Techniques

Sources of polluted water and sewage included in this study were: Lytle Creek, receiving the effluent of the sewage treatment plant at Wilmington, Ohio (11), the trickling filter plant at Dayton, Ohio, and the activated sludge

**Table 1. Occurrence of potentially pathogenic fungi isolated from Lytle Creek, Clinton County, Ohio, 1952-53**

[Number of colonies in thousands per gram dry weight of sample]

Station <sup>1</sup> and fungus	1952										1953		
	3/27	4/17	5/15	6/12	7/10	8/7	9/18	10/23	11/26	1/14	2/25	3/30	
Station 1.0													
<i>Aspergillus fumigatus</i> -----	10	26	10	16	26	24	0	0	0	0	62	14	
<i>Geotrichum candidum</i> -----	76	30	38	0	8	116	8	0	122	308	152	50	
Station 2.8													
<i>Aspergillus fumigatus</i> -----	234	46	8	36	32	10	0	0	14	0	34	0	
<i>Geotrichum candidum</i> -----	156	20	28	0	10	110	0	0	154	76	96	0	
Station 4.2													
<i>Aspergillus fumigatus</i> -----	118	74	86	72	44	0	18	40	10	40	28	44	
<i>Geotrichum candidum</i> -----	288	0	34	0	144	0	16	8	126	44	38	38	
Station 5.2													
<i> Allescheria boydii</i> -----	0	0	0	0	0	0	30	0	0	0	0	0	
<i>Aspergillus fumigatus</i> -----	108	108	38	46	8	0	8	0	10	60	54	30	
<i>Geotrichum candidum</i> -----	74	20	10	10	0	0	0	36	42	58	42	182	
Station 6.5													
<i>Aspergillus fumigatus</i> -----	118	24	138	0	0	0	10	0	0	0	44	20	
<i>Geotrichum candidum</i> -----	46	416	56	0	10	0	0	0	490	20	230	98	
Station 7.2													
<i>Aspergillus fumigatus</i> -----	100	20	40	30	8	32	0	0	0	68	20	14	
<i>Geotrichum candidum</i> -----	540	50	38	308	24	132	300	318	154	96	342	280	
Station 7.6													
<i> Allescheria boydii</i> -----	0	20	10	0	0	0	0	0	0	10	0	0	
<i>Aspergillus fumigatus</i> -----	16	186	24	58	26	0	10	16	20	50	24	54	
<i>Geotrichum candidum</i> -----	146	20	10	300	34	300	0	0	48	42	204	152	
Station 8.7													
<i> Allescheria boydii</i> -----	0	20	0	0	0	0	0	0	0	0	0	0	
<i>Aspergillus fumigatus</i> -----	172	24	124	30	10	24	8	40	20	30	20	20	
<i>Geotrichum candidum</i> -----	316	30	18	20	0	100	0	50	348	24	14	20	

<sup>1</sup> Stations numbered according to distance in miles from mouth of creek. Stations fall in following pollution zones: Clean water, 1.0, 2.8, 8.7; zone of recovery, 7.6, 4.2; septic zone, 5.2, 6.5, 7.2; point of outfall from Wilmington, Ohio, sewage treatment plant, 7.2. See also Cooke (11) and Gaufin and Tarzwell (14).

**Table 2. Occurrence of potentially pathogenic fungi isolated from various stations in the Dayton, Ohio, sewage treatment plant, 1952-53**

[Number of colonies in thousands per gram dry weight of sample]

Station and fungus	1952							1953			
	4/3	6/19	7/17	8/14	9/25	10/30	12/10	1/29	2/12	3/19	4/14
Imhoff-tank sludge											
<i>Allescheria boydii</i> -----	N. S.	130	0	1,430	0	150	0	680	170	0	0
<i>Aspergillus fumigatus</i> -----	N. S.	0	780	130	520	450	170	0	0	0	0
<i>Geotrichum candidum</i> -----	N. S.	1,170	10,920	8,060	2,600	17,700	11,560	10,710	17,000	3,740	2,550
Scrapings, surface stone, high-rate filter											
<i>Allescheria boydii</i> -----	0	2,520	0	4,410	0	0	0	0	0	0	0
<i>Aspergillus fumigatus</i> -----	630	0	7,560	0	2,520	0	0	0	0	0	0
<i>Geotrichum candidum</i> -----	7,560	5,670	7,560	111,510	31,500	162,478	137,780	24,900	310,420	46,480	25,730
Scrapings, surface stone, standard filter											
<i>Allescheria boydii</i> -----	0	0	0	630	0	0	0	0	0	0	0
<i>Aspergillus fumigatus</i> -----	1,260	0	4,410	0	0	0	0	0	0	0	0
<i>Geotrichum candidum</i> -----	5,670	8,190	5,670	18,270	31,500	96,250	28,220	946,200	37,350	3,320	7,470
Wet, freshly poured digester sludge											
<i>Allescheria boydii</i> -----	0	54	0	4,536	0	130	0	0	0	72	N. S.
<i>Aspergillus fumigatus</i> -----	0	0	108	270	108	62	216	0	0	72	N. S.
<i>Geotrichum candidum</i> -----	324	324	432	1,620	0	6,884	4,536	144	3,816	2,808	N. S.
Medium-dry sludge on drying beds											
<i>Allescheria boydii</i> -----	0	0	0	570	0	204	0	80	0	0	0
<i>Aspergillus fumigatus</i> -----	0	0	0	30	0	34	80	80	40	0	0
<i>Geotrichum candidum</i> -----	60	90	270	30	0	408	880	480	4,000	0	360

N. S. = Not sampled.

plant at Yellow Springs, Ohio. Techniques of sample collection, dilution, plating, media preparation, and colony counting have been described by Cooke (12).

## Results and Discussion

Among the resulting fungus isolates were several cultures of a gray mold, some of which bore bodies which were at first thought to be pycnidia. Further study of young cultures on Leonian's agar showed that these were perithecia containing evanescent asci. These cultures were sent to Dr. Roy F. Cain at the University of Toronto, who identified the fungus as *A. boydii*, a fungus which causes mycetoma. Isolates of this gray mold which did not pro-

duce perithecia were identified as *Monosporium apiospermum* which Emmons (13) demonstrated is the imperfect stage of *A. boydii*.

More recently Ajello, in laboratory reports dated October 21, 1954, confirmed pathogenicity of two cultures through mouse passage tests.

*A. boydii* has been recovered 37 times and has appeared in 22 colony types on rose bengal agar. The 22 colony types show some polymorphism in the vegetative state, which can be grouped under variations of the following pattern: usually floccose or cottony; rather compact but sometimes rather loose; usually white and with white mycelium reaching above the main colony and spreading around its periphery, with cream to pale- or olivaceous-green shades in the center of the colony and under the white hyphae.



When the *Allescheria* phase was isolated directly, these colonies had perithecia in them. Perithecia were not recognized as such partly because the asci break down soon after spore formation and the whole mass appears as a pycnidium with abundant spores. Within the several types of media on which the fungus appeared, there was no significant difference in colony appearance, and there was no significant difference between colonies obtained in winter or summer. In stock cultures in which the mycelium is gray instead of white, there seems to be a better production of perithecia on dextrose-phytone agar than is indicated in the literature for this species.

The occurrence of this organism in southwestern Ohio isolations in 1952 and 1953 is presented in tables 1-3. From the evidence presented, it appears that *A. boydii* is able to survive and possibly to develop in beds of polluted streams and in sludges in sewage treatment plants. It also appears on trickling filters in warm months. The numbers of colonies cited indicate a theoretical maximum rather than an actual number since the spore or mycelial fragment (or spores or mycelial fragments)

which developed on the primary isolation plates could have been the only viable propagules present in the approximately 100-ml. sample obtained from the habitat sampled. The fungus appears to develop more readily in the spring and summer months, although it has been isolated at other times of the year. No isolations have been made to determine whether or not other reservoirs of this fungus occur in southwestern Ohio.

From this series of isolations it appears possible that *A. boydii* is a member of the natural population of organisms in sewage and in polluted and fairly clean parts of streams. It further seems probable that the fungus is a member of the natural population of the soil, not only from reports of isolations by Emmons (15) and by Ajello (1), but also because the stream and sewage plants under study are fed in part by natural drainage waters which could carry spores and other inoculums from the soil to the stream and the sewage treatment plants of the area.

The isolations of *A. fumigatus* as to source and number of colonies are shown in tables 1-4. This fungus appears to be less abundant in the

**Table 3. Occurrence of potentially pathogenic fungi isolated from the Yellow Springs, Ohio, sewage treatment plant (activated sludge type), 1952-53**

[Number of colonies in thousands per gram dry weight of sample]

Station and fungus	Date and number of colonies			
	5/29/52	7/31/52	10/9/52	3/11/53
First aerator chamber				
<i>Allescheria boydii</i> .....	0	0	0	0
<i>Aspergillus fumigatus</i> .....	0	0	5,000	0
<i>Geotrichum candidum</i> .....	125,000	22,500	45,000	49,500
Last aerator chamber				
<i>Allescheria boydii</i> .....	0	0	0	0
<i>Aspergillus fumigatus</i> .....	0	0	2,100	5,400
<i>Geotrichum candidum</i> .....	21,000	8,400	33,600	72,900
Digester sludge				
<i>Allescheria boydii</i> .....	0	0	660	0
<i>Aspergillus fumigatus</i> .....	0	250	0	0
<i>Geotrichum candidum</i> .....	20,000	2,750	7,000	9,280
Air drying sludge				
<i>Allescheria boydii</i> .....	260	810	770	0
<i>Aspergillus fumigatus</i> .....	0	84	0	0
<i>Geotrichum candidum</i> .....	10,080	0	4,284	56

more polluted portions of Lytle Creek and in the summer months. At the Dayton sewage treatment plant, it is abundant on the trickling filters in the cooler months, and it occurs commonly in both wet and drying sludges and in the Imhoff and secondary digester tanks. The complete picture of its occurrence at Dayton and Yellow Springs is not given since only sample stations selected as representative of the treatment processes are cited in tables 2 and 3. Its sporadic occurrence may be a result of sampling error.

Table 4 shows that this fungus is present, not only at Lytle Creek and at the Dayton and Yellow Springs sewage treatment plants, but in several other more or less polluted areas sampled only once or sporadically. Several samples taken along a stream draining the effluent from the Schenley Laboratories plant into Tanner's Creek near Lawrenceburg, Ind., yielded large numbers of this fungus. It was found in a sample of Ohio River water, as well as in pool sediment and bank soil in the relatively clean stream, Cowan Creek, in southern Clinton County, and in bank soil along a clean creek draining the south slope of Fort Ancient, Warren County, Ohio. It was found in sewage plant effluent at Ithaca, N. Y., in September 1952, as well as in a sample of water taken from Cayuga Lake.

*G. candidum* was found to be one of the commoner species associated with polluted water and sewage (tables 1-4). It is exceedingly abundant on the trickling filters at Dayton, although it also occurs in other parts of the treatment plant. It is very common in activated sludge samples from aerators at Yellow Springs. In the small stream carrying the effluent from Schenley Laboratories to Tanner's Creek, it forms a mat on the creek bank as much as 1 cm. deep. It is common on the trickling filter at Glendale, Ohio, and was found in all areas sampled in the vicinity of the sewage treatment plant at Ithaca, N. Y. It occurs in the Ohio River and in riffle sediments and bank soil in the creek along the south slope of the Fort Ancient, Ohio, ridge.

*G. candidum* is a polymorphic fungus with many variant strains, none of which has as yet been induced to produce a sexual state. It is

**Table 4. Occurrence of potentially pathogenic fungi isolated from miscellaneous sources, 1952-53**

[Number of colonies in thousands per gram dry weight of sample]

Location	Date	Fungus	
		<i>Aspergillus fumigatus</i>	<i>Geotrichum candidum</i>
<i>Schenley Laboratories, Lawrenceburg, Ind.</i>			
Effluent-----	June 26, 1952	4, 300	0
	July 31, 1952	0	17, 000
Gray material on bank washed by stream-----	June 26, 1952	1, 200	400, 000
	July 31, 1952	0	420, 000
Dry soil on bank above stream---	June 26, 1952	400	1. 2
	July 31, 1952	0	16. 8
Creek water about 100 feet below effluent outlet---	June 26, 1952	2, 000	1, 000
	July 31, 1952	0	30, 000
<i>Glendale, Ohio, trickling filter</i>			
Influent-----	July 31, 1952	0	200
	Mar. 11, 1953	0	280
Scrapings from surface stone----	July 31, 1952	0	7, 000
	Mar. 11, 1953	0	4, 200
Ohio River water, public landing, Cincinnati, Ohio	June 26, 1952	3	3

possible that, of the many strains which exist, a few may be pathogenic. The many strains of this fungus are morphologically and physiologically fairly closely related so that, although a large number of names has been suggested, only one clearly defined species appears to be involved. In citing this fungus, most people have preferred to use the term "*Geotrichum* sp." In a recent study with 16 strains, Bobrov (8) was able to find only the type of germination of the arthrospore as a basis for the segregation of three major strain types. She found she could not base species on this character. The group of strains she studied included cultures isolated from sewage, decaying leaves, and sour milk, as well as strains from suspected cases of geotrichosis in man and from sputum specimens from patients with other disorders.

"people are more important than potatoes," and that a base of data be made available to scientists to determine the causes of accidents in order to get prevention programs on a sound footing.

From this remark stemmed the discussion of fatigue and endurance limits, nutritional lacks and aids, hazardous habit patterns, emotional stresses, apathy, environmental dangers, and extended insurance systems.

Dr. Conrad Barnes, Seneca, Kans., pointed out that emotional upsets are behind a good many farm accidents. "There's too much ignorance of emotional hygiene," Dr. Barnes said. "It has been proved that most accidents have this emotional behavior pattern . . . the accident victim is momentarily blinded because he is upset."

Another panelist, F. R. Willsey, farm safety specialist at Purdue University, said that modern machinery was now becoming more responsible for accidents than livestock. Tractors, he said, are responsible for most farm accidents. Also common are injuries from cornpickers. Too many farmers think they have a safe way of unclogging a cornpicker without shutting it off. The trouble is, he said, they keep thinking that way as long as they get away with it or until they lose a hand or an arm.

In support of Willsey's point, Ordie Hogsett, safety specialist from the University of Illinois, another member of the panel, showed that he had lost his left hand as well as two fingers from his right in a cornpicker accident in 1943. Since then he has devoted his time to farm safety work.

Helen Becker, health education specialist of the University of Nebraska Extension Service, suggested that more farmers ought to observe Sundays as a day of rest for themselves. In the past, she said, farmers didn't work on Sundays in order, they said, to give their horses a rest. Now that they have tractors, they work longer hours and their fatigue predisposes them to accidents, she said.

Sanitation, diet, physical examinations, immunization programs, safety measures, and

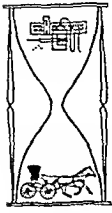
livestock disease control all are the responsibility of the farm family, declared Mrs. C. C. Inman, Bancroft, Iowa, chairman of the women's committee of the Iowa Farm Bureau Federation, in discussing the rural family's responsibility toward health. In addition, Dr. B. L. Masters (see brief) said that the first health measure a rural family should take is to get a family doctor. Lester Lane, Wilmington, Ohio, farmer, pointed out discrepancies in the theory that rural residents enjoy better health than city dwellers. They are, for example, more likely to get brucellosis and certain other diseases. In one community, Lane stated, a survey showed pasteurized milk was used by only 16 percent, sewage disposal was bad, and immunization for preschool children was lax.

The predilection of those present seemed to be to encourage programs which develop in the individual a sense of responsibility toward maintaining his health and improving it and toward working with others on health problems. This cooperative effort, they felt, will solve most, if not all, of the health problems of any rural community in a manner that is satisfactory to the largest number of citizens. An improvement suggested by some for future meetings was to have more representation from the field of public health.

The Council on Rural Health, a section of the American Medical Association, is composed of a chairman, a liaison member from the AMA board of trustees, and 9 regional directors. The council is assisted in its work by an advisory committee selected from national farm organizations, such as the Grange and the American Farm Bureau Federation. Representatives from education, research, and information organizations whose interests are focused on agriculture are also named to this group.

Presented on the following pages are briefs from one complete panel presentation—the one on using present health and medical care resources—and from some of the prepared remarks made by panel members in the other discussions.

# The New Frontier In Rural Health



It is hard to conceive that any intelligent, right-thinking person would fail to recognize that as a Nation we have the best health and medical care facilities and services in the world.

Yet we have some relatively large minority groups whose health is to day sorely neglected. They are:

1. The aged with their chronic, degenerative diseases; their health, social, economic, employment, educational, recreational, and housing problems.

2. The disabled who need both treatment and rehabilitation.

3. The mentally ill who need not only treatment and rehabilitation but frequently a helping hand from a neighbor if they are to take and maintain their place in our modern life.

These three do not constitute all of the health problems of today, but they stand out like the communicable diseases did 40 years ago.

## *Resolved at Local Level*

Communicable diseases and the diseases of infancy, childhood, and young adult life are not unimportant, but we have progressed far in developing preventive and curative facilities and services for these problems. In our enthusiasm we have, until recently, forgotten the diseases commonly associated with middle and older age. This is true in the research field, the preventive and curative fields, including rehabilitation, and in the intraining and education of our health, medical, and hospital personnel.

In planning, we should not forget the lessons we have learned in other programs. In maternal and child health programs we taught and dem-

onstrated that the problem could be resolved best at the local level by using local physicians, local hospitals, and related services in providing both the preventive and curative phases. It required education and training of physicians, health and hospital personnel, and finally, of the people themselves to make use of and to assist in providing good hospital and related facilities and services at the local level. It required close cooperation of the local voluntary and official health agencies and provision by the State of services and facilities that could not be provided locally, such as medical schools, graduate medical training, and laboratory services and facilities as well as services in the unusual and very technical fields.

In the case of tuberculosis, the State of Minnesota, as early as 1913, assisted counties in building county sanatoriums and subsidized the care of patients in them. Many of these are no longer needed for the care of tuberculosis patients. They are being converted into nursing homes, which are acutely needed. The same is true of the occasional community hospital which is still a good structure and has been replaced by a new, modern hospital.

## *Hospitals and Distances*

Today, a modern hospital within a reasonable distance is essentially a must for most people. The only argument is, what is a reasonable distance? Is it 20 miles, 30 miles, or 50 miles? In each area, depending upon the population densities, highways, topography, the availability of physicians, and a number of other factors, this determination must be thoroughly studied and carefully made by all persons concerned.

In general, a hospital of 25 to 50 beds, well equipped and providing services for 10 to 15 thousand people economically can provide fairly complete and good services. Such a hospital will usually have 7 to 15 doctors on its staff. The distribution of physicians in the rural areas would average 1 for 1,000 to 1,200 persons in a State which has an average of 1 physician per 700 population.

Hospitals of less than 25 beds usu-

ally have so many limitations because of economics, staffing difficulties, and availability of physicians that it would, I believe, be better to avoid such hospital construction and development until all other possibilities have been explored and exhausted. Certainly, an extra 10 miles of travel for one-third or less of the patients using the hospital is not usually a justifiable reason today.

## *Physicians and Hospitals*

All of us are interested in keeping doctors in rural areas. We would like to have one living next door, in the next block, in our village. In the years past, there used to be one in most villages and towns as there also used to be a dentist, a pharmacist, a newspaper, a bank, a general store, a hardware and farm implement store, a lumber yard, and a high school. In the past 40 years, technical improvements, modernization of services, and transportation advances have changed all this.

Physicians inevitably are moving to nearby communities which are of sufficient size to justify the provision of a modern hospital. Here the physician has services and assistance in doing a good job and associates to help him out of tight spots. He wants a good X-ray service, a good laboratory, a blood bank, good delivery and operating room services, good anesthesia, good nursing care, and physical and occupational therapy in the hospital. He wants a pathologist, a radiologist, and a surgeon on the hospital staff, and he would like other specialists on the consulting staff. In short, he wants to do a good job in the practice of medicine.

## *Needed Care Facilities*

The community needs for the proper care of patients with long-term illness are sufficiently complex and varied to require a wide range of services and institutions. Certainly, the patient's home and the usual type of general hospital, at the two extremes, are not sufficient. Improved intermediate facilities are urgently needed. The range of facilities in the order of increasing complexity is as follows:

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1. *The patient's own home.* This may be best if the patient's disease is not too incapacitating and his need for service is not too great. He should be able to visit the physician's office or the clinic periodically. Care should be provided by a member of the household or by a visiting nurse. Temporary auxiliary assistance, such as the services of a housekeeper, may be necessary. In some communities, the services of a physical therapist may also be available.

2. *Home for the aged.* This institution primarily provides custodial care for older persons who cannot be cared for in their homes.

3. *Nursing home.* This type of facility should provide considerable nursing care and regular medical supervision for indefinite periods of time for patients who do not need intensive hospital services. It has been strongly recommended that nursing homes be associated with general hospitals, thus providing a flexible unit for the hospital as well as an improved standard of care for the patient.

4. *Chronic disease hospital facility.* Except for diagnosis and for acute exacerbations, the general hospital is neither the best nor the most economical place to care for most patients with long-term illnesses who require hospital care. Many new chronic disease hospitals with good nursing service and medical supervision, with adequate equipment and personnel for rehabilitation, and with facilities for research and teaching are now being developed.

### *Planning Local Facilities*

With the aim of reducing costs and improving patient care, it is recommended that groups sponsoring new nursing homes and homes for the aged give serious consideration to locating such facilities in close proximity to existing general hospitals. Local health departments should aid in planning and developing. This will provide a chain of related care facilities where the patient can be transferred readily from one to the other institution as he requires varied types of care. Physicians and other health workers in a community should be familiar

with all the facilities available so that the proper one can be selected for each case. Best use of medical manpower, with less risk of duplicating effort and services, is a possible advantage.

Successful rehabilitation of the disabled must begin in the early stages of hospitalization and must be based on a philosophy of the cure of the individual as a whole. Added to the physical changes brought about by chronic illness are the emotional and social changes frequently resulting from long illness and the social withdrawal caused by the illness. Emotional and social needs must be recognized and met through a planned program of activities.

Very often, with skillful functional training and guided practice, patients at least can learn to perform self-care activities regardless of their age.

### *Shortages of Personnel*

The greatest single obstacle to the more rapid development of all types of rehabilitation services is the shortage of trained personnel. The need for physicians, physical therapists, occupational therapists, nurses, and other personnel in the rehabilitation field is tremendous as is the need for sufficient trained personnel to staff our health departments and our general hospitals.

We should start with increased emphasis on recruitment to insure that all of the existing training facilities are being utilized. There is no magic solution to the current personnel shortages in the health field. The recent work of the National Health Council in publishing manuals to aid vocational guidance counselors to alert high school students to careers in public health is an excellent approach. We have a responsibility to plan wisely in using the talent we have and to encourage young people to enter a field where jobs are plentiful and the opportunities for service are unlimited.

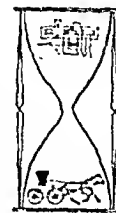
Never before have the opportunities for restoration of the disabled been so promising. We must recognize that we are now in a position where we can approach with confidence many conditions which were considered hopeless until recently.

## *The Community's Responsibility*

The community, individually and collectively, must recognize that it has the responsibility for providing the modern physical facilities necessary for the care of these patients. These include health departments, general hospitals, chronic disease units of general hospitals, and nursing homes and homes for the aged planned in close proximity to general hospitals. Equally important is the community responsibility for providing financial support to assure that such modern facilities will be well operated and staffed with qualified professional personnel. Community groups should recognize the social, religious, educational, and recreational needs of these patients.

Each individual must also recognize that he has the responsibility of protecting himself against the ravages of time and its associated physical changes by regularly utilizing the local medical services and their associated diagnostic and treatment facilities. Periodic physical examinations are especially indicated during middle life and should be continued through the declining years. By so doing, the incidence and severity of chronic illness can be reduced and the time postponed when chronic illness may require greater use of these facilities.

## *The Country Physician And the Rural Clinic*



If there are any two things that are more confused than medical care and health, I don't know what they are! Because the doctors themselves get the two confused, they seem to think that when you mention health, you are immediately mentioning medical care. However, that is not true. As I see it, medical resources are the

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*By Wyatt Norrell, M.D., chairman of the committee on rural health, Kentucky State Medical Association.*

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job of the medical profession—that is to train boys and girls to become good humane doctors. Health resources are the job of everyone, because it is the job of all to see that the other has good health. You buy medical care, a procurable commodity. The doctors are trained in our medical schools and then go to the communities and set up the proper facilities to take care of the rural people.

### *Changing a Pattern*

The very backbone of our life, as I see it from the medical standpoint, is the family physician. But you're not going to find the family doctor at every crossroad. Why? Well, because transportation is much more rapid than it was 50 years ago. Back in 1915 there were four doctors in my home town. The people could not travel to town in those days as they can and do now.

After World War II, I decided to practice medicine in the county seat of the county in which I was born. When I started, I had an Army jeep procured from the Army surplus. The jeep had some flappy curtains on it, and there were some nights that I arrived at the country home of a patient more frozen than alive. I spent about two-thirds of my working day traveling around the countryside in my jeep, seeing the different individuals in their homes.

This was not the type of medical care that I wished to give the patients. First, it was impossible for me to give good medical examinations in the home; and second, time and distance prevented me from taking care of as many people as I would have liked. I mentioned that fact to the young cashier of the bank, stating that I would like to build a clinic. He took the facts before the loan committee of the bank, and one of the men on the loan committee asked: "What collateral does he have?" His answer was: "Character," and, he added, "We need medical care in this community."

Well, I got the loan; I built the clinic; and I am beginning to see the end of my bank indebtedness. I used this personal illustration to drive home a point. We hear so much about the need for hospitals, and I

believe if you let some individuals have their way there would be a hospital at every two-house crossroad town. The Nation would be bankrupt, and I know it couldn't be very long until the hospital would be in the hands of a receiver.

### *Clinics and Nursing Homes*

The answer to our medical resource work is the use of clinics. Eighty-five percent of the people whom I see can be taken care of and diagnosed in my clinic and then be treated either in the home or by daily visits to the clinic. There is a small 30-bed hospital about 13 miles from where the clinic is located. An individual who is in need of more definitive care can receive it in this hospital.

Another aid to our national medical and health resources is the recent founding of the American Nursing Home Association. This group has done much to help in the care of our aging population. Many of the beds in our hospitals could be released for acutely ill patients if more nursing home beds were available for the elderly and chronically ill patient. It has been proved over and over that the senile patient does react better in the friendly surroundings of the "homelike" nursing home than in the well-regulated hospital atmosphere.

So I say to you as you go back home—help the young doctor when he finishes his medical education. Help him get started in the community. Show him that you want to give him the facilities that he needs. Get the bank to back him; help him to find a home or get one built for him. He needs your help because most doctors, when they finish medical school, not only don't have any money but usually are in debt.

### *A Personal Responsibility*

Now to the questions of how to utilize properly our health resources. Health is a personal responsibility. It is the responsibility of the community in which you live. Each individual is dependent on the other individual. All this goes back to the ideas and ideals on which our Nation was established.

Before a rural health council was established in our county, the tuberculosis X-ray unit came through. We took 520 chest X-rays from a population of 11,000 people. Then the rural health council was established. The next year we got 1,485 chest X-rays. And then everyone seemed to get a beam of light, an idea of what they could possibly do.

So the project was completely organized. One of our young clergymen served as a publicity chairman. A farmer, with a stature of 6 feet 7 inches, weighing 260 pounds, was the "stevedore" or the "whip" of the organization—in other words, the chairman of the rural health council. And he saw to it that there was a shuttle bus system worked out in the county, that the high school children acted as stenographers, that the organization was put over; and therefore we had better than 2,000 chest X-rays done. Isn't this an illustration of what a rural health council can do?

### *The Four Obstacles*

There seem to be four main obstacles to solving our rural health problems as we try to set our sails to reach a goal. All of these four must be defeated before we can successfully utilize our health resources. They are:

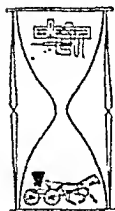
1. *Unimportance*—Acting as if what you do, or can do, or are asked to do, is of no importance. Let George do it. What difference does it make if the school children don't get a good diet so long as my kid does. Someone else will do something about it, so why should I worry?

2. *Fatalism*—Believing that man cannot control his environment. In other words, if I may use the statement, "the health as we know it in the rural area was good enough for my grandfather, so it's good enough for my children."

3. *Surrendering en masse*—and forgetting about the greatness of our Nation, and its founding on God, and on certain principles basic to the dignity of man. Each individual should have in his hands his life and not be totally at the mercy of the State. Help from government bodies should not be spoon-feeding types.

4. *Accepting fanaticism*—In other words, accepting some of the fanatic ideas of individuals who do not think clearly. Or accepting the idea that nothing can be done about it. Let's not believe we don't have to do anything about our health problems. But rather, let's take a way of life of accepting the fact that we are our brother's keeper. And remember that when we do something for another person, some of that good is going to fall on us.

## Labor and Medicine In Tennessee



Three unusual factors have made the Tennessee experiment to bring medical care to isolated rural areas a success. Organized medicine and organized labor originally cooperated to solve the medical care problems of rural people, many of whom now work in industry. On-the-scene consultant services reduced total costs to the patient who otherwise was hauled miles away out of his environment for treatment. A new type of internship for medical students gives them a practice in these isolated areas they would never know in a university hospital.

Other organizations and agencies quickly joined medicine and labor. These groups included the Farm Bureau Federation, the Agricultural Extension Service, Vanderbilt University and the University of Tennessee Medical Schools, the Federated Women's Clubs of Tennessee, the Tennessee State Public Health Department, the State Nurses' Association, the State Dental Association, several county courts and one large Society of Doctors' Secretaries.

Frankly, we were shocked into action when a 1952 study of medical care situations in mining communities of nine coal-producing States

showed there were many areas where medical care was almost completely lacking. The study was made by the AMA and it was joined by the United Mine Workers, which last year spent \$56 million for medical care of miners and their families.

Our approach involved these activities.

1. Surveying the actual needs and lacks in four "target communities," such as Clearfork Valley.

2. Stimulating the people to recognize and accept their own responsibilities in the field of rural health.

3. Obtaining money to operate a special organization dedicated to extending medical care to isolated communities.

4. Tapping the resources, brains, and brawn of all organizations to help in this crusade to elevate living standards while providing medical care.

5. Recruiting doctors, nurses, public health personnel, dentists, and sanitarians who were willing to live in communities that appealed only to those with missionary zeal in their hearts.

We organized the nonprofit Tennessee Medical Foundation. Membership at present is confined to doctors, dentists, and nurses. Armed with a functional organization and definite plans to begin work on four "target areas," we appealed to the Commonwealth Fund for some cash.

Armed with a small initial grant of \$19,500 from the Commonwealth Fund and a smaller amount of money from membership dues, the Tennessee Medical Foundation opened offices in Knoxville, the center of the target area. In Clearfork Valley, the miners worked on their off-days and even holidays to rebuild an old commissary into a modern clinic. And they paid for the materials from their own meager earnings, giving to these people a feeling that the clinic belongs to them. This means they will patronize it and fight for its continued growth.

There were headaches, oh yes, and there are headaches still. One of these involves the reluctance of patients to undergo for medical examination. But the knowledge that the examinations frequently revealed no serious conditions, such as can-

cer, has brought some changes in these attitudes.

This experiment has changed several phases of medical care. In Clearfork, where there was not even a licensed practitioner, the patients had to be hauled 75 to 100 miles to be examined by specialist consultants. Not anymore! Under an agreement between the UMWA Welfare and Retirement Fund and several of our local medical societies, 10 specialists make one trip each month to the Clearfork clinic to examine the specialty cases. This examination does not cost the patient an extra cent. The UMWA pays the specialists \$100 per visit for the 160-mile trip. But the physicians endorse their checks right back to the medical foundation.

A special prepayment plan was developed for the Clearfork clinic. The miner, farmer, or lumberman signs this agreement. That entitles his entire family to medical care for an entire month for only \$3.50. There are a few extras, such as costly medicines and X-rays, for which he must pay above this base. The extras also are relatively inexpensive. For example, an X-ray costs \$2. Remember that the miners in this valley average about 9 working days per month and many of them have 6 to 10 children. Their mine wages run from \$18 to \$24 a day. We simply had to offer a realistic program on the dollar side. Even so, this clinic after only 6 months of operation is now breaking even.

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*By Ed Bridges, public service director, Tennessee State Medical Association.*

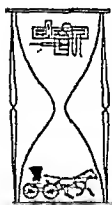
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The three other target areas had different problems, so our approach had to be tailored to fit each need. In one prosperous coal mining area, the need was for a large hospital. The medical foundation obtained local, State, and Federal funds, and the hospital will soon be occupied. In still another coal area, the need was for a small overnight clinic, a doctor, and a dentist. After a year of missionary work, one of our doctors convinced the county court that it should appropriate \$25,000 for a clinic and another \$10,000 to equip it, and give both a doctor and a dentist free rent for an initial 3 years.

The two medical schools sent rotating interns, in teams of two, into these isolated areas for periods of 3 months to assist the clinic director. The interns receive pay and full credit for the time.

## Northern Plains States' Survey of Health Needs



The region between the mountains and the prairies is sometimes referred to as the "saddle of the Great Plains." These sparsely populated States are largely agricultural. The maintenance of all kinds of public services is difficult.

Back in the dust bowl days, destitute conditions among the ranchers and farmers in this region caused the formation of an agricultural council to study ways and means of improving the situation.

One obvious and persistent problem had to do with maintaining health and providing adequate health services. Consequently a special committee, known as the Northern Great Plains Health Committee, was organized. Its objective was to study the health needs and resources of the region and to make these known to the people.

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*By Mrs. Frances Macdonald, health specialist, Montana State College, and chairman of the Great Plains Health Committee from 1948 to 1954.*

## Local Studies

The committee made various local studies. It assisted in the original hospital survey. It held workshops for the exchange of information and ideas. In 1953, it agreed to make a county-by-county survey of specific health services in North Dakota, South Dakota, Nebraska, Kansas, Wyoming, and Montana.

This survey was made by local groups of professional and nonprofessional persons. The county extension agent in each county served as the leader of each county survey group. Over 1,000 persons participated. Many improvements have been made by these local community groups as a result of their own study of their own situations.

Most of the States have been trying to keep current information available. For instance, in Montana there were 39 more physicians in September, 1954 practicing in the State than there were in March 1953. Without exception, these physicians located in communities in which there were hospitals, good school systems, adequate housing, telephones, and other desirable features.

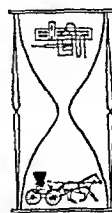
The number of dentists in Montana increased by 39 between March 1953 and January 1954. During this same period, the number of dentists in the 17 counties of Montana with populations of over 10,000 increased by 41. So we see that not only are professional workers locating in desirable communities, but, in the case of dentists, they are actually moving from the smaller to the larger communities.

Organized public health services are still lacking in many, many counties in this whole northern Great Plains region. Public land and tax problems are a factor, and again the sparse population makes the delivery of public health services very expensive and sometimes ineffectual.

The committee believes that much can be done to help people understand that modern medical practice can only be carried out efficiently and effectively in some kind of health center, or community clinic, or hospital. We also believe that rural people are coming to understand that good roads and telephones are an es-

sential part of good health services, and that it is no longer necessary to think of a physician or dentist being within so many miles of the family, but rather within so much time of a family.

## The Extension Service In West Virginia



A look back over the records of West Virginia extension work shows that from its beginning—more than 40 years ago—health has been woven into the rural life pattern. In

the home demonstration and 4-H club phases, health activities have stood out as an important part of each year's design and have added strength to the entire rural life fabric woven by the people of the State.

You ask why we in extension are concerned about rural health? Why don't we stick to agriculture and home economics and leave health matters to the technically trained professional health workers?

As members of the extension service of a land-grant college, we are charged with the responsibility of giving the kind of information and guidance the people need to make an intelligent, practical approach to the solution of their problems—the kind of information they can use to achieve a satisfactory level of living.

When rural people, particularly homemakers, have an opportunity to list the problems that are of greatest concern to them, and on which they would like to have help from the extension service, almost invariably health stands at or near the top.

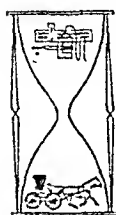
Since it is one of their major problems, and since it cannot be separated from foods, clothing, housing, and other essentials of a good level of

*By Gertrude Humphreys, State leader, home demonstration work, Agricultural Extension Service, West Virginia University.*



4. *Accepting fanaticism*—In other words, accepting some of the fanatic ideas of individuals who do not think clearly. Or accepting the idea that nothing can be done about it. Let's not believe we don't have to do anything about our health problems. But rather, let's take a way of life of accepting the fact that we are our brother's keeper. And remember that when we do something for another person, some of that good is going to fall on us.

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*By Ed Bridges, public service director, Tennessee State Medical Association.*

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their counties. A lack of instructors for these courses was, and still is, a serious problem.

### *The Medical Profession*

Another of the problems—"how to get a doctor when needed"—called for the cooperation of the extension service and the medical profession. It seemed advisable to prepare a leaflet to serve as the basis for study and discussion of the problem. A tentative draft was submitted to the School of Medicine of West Virginia University and to an official of the West Virginia State Medical Association.

In counties requesting help on this problem, the home demonstration agent contacted a representative of the county medical society to discuss the purpose of the lesson and to enlist the assistance and cooperation of local physicians. The response was excellent. At county leader-training meetings, physicians and rural leaders sat down around a table as members of a panel and talked over the problems of the physician who practices in rural areas and those of rural people who feel the need for better medical attention.

The use of this lesson represents just one more step in the development of a closer working relationship between the rural people and the medical profession. It began about 8 years ago.

Each year since 1947 the State Home Demonstration Council and State extension workers have cooperated with the State Medical Association in conducting a State rural health conference. These have brought together representatives of the various agencies and organizations interested in rural health and have given those in attendance a better understanding of health problems in the State. Also, they have given the health leadership a greater appreciation of the value of working together on health problems that are countywide or statewide in scope.

### *Help From Others*

In the study of highway safety, the West Virginia State Department of Public Safety assisted all extension groups which requested their serv-

ices. Driver-education instructors cooperated when called upon.

For the fire prevention phase of the safety program, city and town fire department personnel responded to the requests for talks, demonstrations, and other help needed by leaders. Personnel of the electric power companies also assisted with talks on carelessness in the use of electricity.

In the statewide 4-H mental health program, the State health department helped the 4-H and adult groups by arranging for psychiatrists from hospitals, county health departments, and private practice to assist the leaders and local groups.

In connection with civil defense, county health officers and Red Cross workers assisted.

Extension agents and rural leaders work with various organizations to help promote educational and action programs such as the detection and control of tuberculosis, cancer, and heart disease. They work in cooperation with health departments and with schools on dental health problems and school lunch programs. They assist county health departments to hold immunization clinics and well-child conferences. They are active members of the State Nutrition Council.

## **Farm Organizations In Ohio**



The two farm and rural organizations with which I am most familiar—the Grange and the Farm Bureau—along with many other rural organizations are making concerted efforts in developing health programs based on the expressed needs of the local groups.

A brief look at the health program of the Ohio Farm Bureau Women's Committee will show what are con-

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*By R. Bruce Tom, chairman of  
the Health Committee, Ohio State  
Grange.*

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sidered to be our resources and at the same time bring out how they are being used through the organizations.

Get more money for public health when needed.

Study county health needs and facilities.

Study school health program.

Secure health education courses in schools.

Establish and support well-child conferences.

Get doctors for communities.

Sponsor and recruit members for home nursing courses.

Help establish and support organizations dealing with special diseases.

Get full-time public health personnel.

Help with blood donor program or get it established.

Promote blood typing program.

Organize and support mental health associations.

Help to establish schools for mentally retarded children.

Help to establish and furnish hospitals.

Cooperate with other groups in organizing county health councils.

### *Grange Health Program*

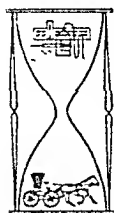
More than 4,100 subordinate Granges across the Nation participated in the 1954 community service program. A large percentage of the activities reported had to do with health and the use of our health resources and medical care. No attempt will be made to give numerical results but a mere listing gives a picture of what is being done:

Health clinics have been started; X-ray units, bloodmobiles, blood banks and blood typing have been provided; thousands of pads for cancer patients have been made; eye and teeth examinations for children instigated; county nurses obtained; portable therapy tank, respirator, and life saving equipment purchased; donations have been freely and generously given to many voluntary health funds.

Other health projects included dog vaccination drives; obtaining doctors for local communities; encouraging health insurance groups; providing equipment and food for hospitals;

school who are at the time of decision on further education, a job, or marriage. Good homes will create emotional balance and security for children. This cannot be emphasized too strongly, and it may be that such a course as it applies to parenthood could be well instituted in many of our schools with great profit to the community and to our country as a whole.

## Illinois Pilot Program On Weight Control



Medical and health authorities generally agree that overweight is one of America's most serious health problems today. This makes control of weight an important practice which every person and family should know about and follow. From studies by health agencies and insurance companies, it is estimated that about 20 to 25 percent of the population in the United States today, or 1 person in every 4 or 5, is overweight to the point that his health is affected.

Being an extension worker, I naturally called on the specialists in the fields of health and nutrition at the University of Illinois to assist the weight control project requested by the Nutrition Committee of the Rockford Council of Social Agencies.

### *Medical Society Assistance*

After county medical society approval was received in May 1953, an internist and a dentist were appointed by the county medical and county dental societies to the committee's medical advisory committee. A pediatrician and a general practitioner joined this group later. The work of this committee was to review and approve the educational materials developed for the weight

control course and also to review and approve the commercial materials before distribution to the class members.

In August 1953, a nutritionist, a health specialist, a health educator, a rural sociologist, and a home economist arranged for a meeting in September with presidents, or their representatives, of civic and service club organizations.

### *Preclass Activities*

The "kick-off" meeting was held on November 17, 1953, at the Y. W. C. A. in Rockford with 150 persons in attendance. The program consisted of a talk by a doctor and a nutritionist and a showing of a film on obesity. Classes were announced to start the second week in January 1954.

Three nutritionists—1 from the University of Illinois Extension Service and 2 from the Illinois Department of Public Health—developed the course of study. This included 8 lessons of 2 hours each. Two of the sessions were joint ones at which time a psychiatrist and a general practitioner talked to the class members on "Why Am I Overweight?" and "The Doctor Speaks." The third joint meeting was the low-calorie dinner.

Topics presented to the group on a discussion and lecture basis were: "Weighing In," "Calories Especially for You," "Food and You," "Choose Your Foods Wisely," "Your Rewards," "Your New Figure."

No one was admitted to the classes without a referral from his family physician. Only women with degrees in home economics were taken as leaders for the project. They were homemakers, dietitians, college instructors, and home advisers.

A refresher course for the leaders was held for 2 days in December 1953 when all the subject matter was reviewed by 2 of the nutritionists who authored the lessons.

### *The Course Is Tested*

When the first classes were scheduled to begin, we found we had 159 persons enrolled. This necessitated the opening of 7 classes.

The course of study was outlined so members could plan their menus according to calories recommended

by their physician; the basic seven was reviewed; a visual aid, which was a comparison of foods with sugar cubes, was set up; portions of actual food for the 3 daily meals giving a 1,400 calorie diet were shown.

Classes were a combination of discussion, lectures, and work sessions, and only one class exceeded the quota of 25 considered an ideal discussion group.

At the last class meeting an evaluation sheet was presented to each class member. We wanted to find out where the member heard about the class; what he thought about the lessons; if he had put any of the class information into use; if he was interested in attending another series of meetings; what he would like to discuss at future meetings; and if he felt he could continue to lose weight without further assistance. It was also at this meeting that members took their measurements and weight for a comparison with those they had taken 7 weeks earlier.

The low-calorie dinner served at this final meeting was 4 ounces of lean roast beef, one-half of a cup of green beans, three-fourths of a cup of tossed vegetable salad with lemon dressing, 1 small roll, one-half a teaspoon of butter, and an apricot dessert prepared with a synthetic sweetener, and coffee (served with synthetic sweetener and skim milk for those who had not learned to drink it without the trimmings).

### *Results of the Course*

As a summary, a total of 115 persons, or 72 percent, completed the course with nearly perfect attendance. Most of the others attended at least part of the time but dropped out because of inconvenience of time, moved away, or other reasons.

Losses of weight ranged from 4 to 28 pounds, with an average of 11 pounds, for the 115 persons. The men lost an average of 13.5 pounds and the women 10 pounds.

At the close of the series, 109 said that they would like to attend another series of classes, and most of them preferred such a series soon. Most made plans to continue meeting together informally for a period of time.

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*By Alfretta E. Dickinson, Winnebago County, home adviser, Agricultural Extension Service, University of Illinois.*

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About 68 persons said that they would be able to maintain or continue weight control without further assistance, but 36 said that they would like to have more help.

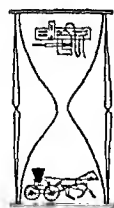
Persons heard about the weight control classes through the radio, newspapers, television, physicians, friends, and home economics extension classes.

Sixty-five physicians made referrals to the weight control classes.

At the close of the program, questionnaires were sent to all members of the Winnebago County Medical Society. All but two physicians indicated interest in having the weight control classes continued regularly.

This pilot study showed the need for a weight control-nutrition program in communities, and it also proved that group work is an asset to the person striving to lose weight. As a result of this study, a brochure, entitled "Guide For A Community Weight Control-Nutrition Project," has been published by the State committee and is available from the Illinois Department of Public Health, Springfield, Ill.

## Operation Rescue Squad In Wisconsin



Rural communities and small towns can increase their medical services at no cost by establishing skilled teams of rescue workers to work closely with physicians, nurses, and other health

officials. These can be instantly available for service in time of local emergency, natural disaster, or military attack.

In every person's life, there have been occasions when a skilled and understanding hand could have relieved suffering and possibly avoided grief. Crises occur without warning—the accident in the home, the highway crash, the farm mishap.

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*By Joseph Banach, safety director, Ansul Chemical Company, Marinette, Wis.*

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Help is needed and needed immediately.

And today, even with increasing and improving medical facilities, the necessary medical care is not always available. This is a particular menace in small towns and rural areas, where a declining population is limiting the number of doctors and nurses. Distances are vaster in small towns and rural areas, also. Time is a vital and often a life-or-death factor. Doctors and nurses are very busy meeting the many demands on their time. Frequently, these demands overlap, and, being only one person, the country doctor is unable to be in two places at one time.

There is need for a group of men, women, and even children with highly developed skills in emergency, first aid, and rescue procedure. The good these people can accomplish cannot be calculated, except in the priceless terms of a saved life and spared pain.

A trained rescue unit, instantly available, can provide sorely needed and invaluable assistance to a physician, surgeon, or nurse. A rescue unit spells the difference between life or death for thousands of seriously injured Americans each year.

### Organizing the Squad

The need of a skilled rescue team in your community and in mine should be self-evident. I'm sure each of us feels that it would be an ideal situation, if only we knew how to go about it. We found a way, perhaps by accident, perhaps by unseen direction.

About 5 years ago in our small city of Marinette, Wis., with its population of 14,000 persons, a few of us working for a chemical company realized that we were in no position to handle any kind of a plant accident or disaster. There was no organized program of first aid; there were few persons with more than a smattering of skill in caring for people injured or taken sick on the job.

Eight of us decided to form a first aid team. For 21 weeks, meeting twice a week for 2- or 3-hour periods, we went through the Red Cross first aid training manual. At the end of that time the fire chief of Milwaukee

permitted us to spend a week with one of the Milwaukee rescue units.

Mostly, however, we were observers. We realized then that the plant first aid training program we'd originally thought of was not broad enough.

We returned to Marinette, continued our training, and awaited our first call for service. But in a factory of only 500 people, plant accidents are fortunately very, very rare. So we decided to make our first aid rescue services available to the families of our employees. Our company had spent a few hundred dollars in obtaining basic equipment for us—a resuscitator, ropes, first aid kits, respiratory protection, cutting torches, crowbars, and fire equipment. We also obtained the use when needed of a company automobile.

Why not offer the services of our eight-man unit to the people of our city—Marinette, Wis.—and to our sister city—Menominee, Mich.?

### Acceptance Is Slow

We consulted the mayors of the two cities, the city councils, police chiefs, fire chiefs, and a few of the leading doctors. They were somewhat skeptical, but they certainly had no objections to the idea. The local telephone companies agreed to put our name in their new telephone directory, along with the police and fire department telephone numbers. The telephone company also agreed to provide us with direct service on any emergency call.

The townspeople, like their elected officials, were slow to accept the rescue squad. From time to time—weeks apart—a call for help did come in to us. But we had not yet overcome the widespread reluctance to accept us.

Then 1 day about 3 years ago a tragic accident took place. A drunken driver rammed into a hay-wagon carrying 26 high school students, chaperoned by the city manager and his wife, on an old-fashioned hayride. The 28 people on the wagon were strewn along the highway. A call went out to the rescue squad for immediate help. Upon arrival, the few members of the squad sized up the situation and im-

mediately called local physicians and the entire rescue squad. Within minutes help was obtained for all of the injured.

All recovered from their injuries, and the praise from a grateful community began to accumulate. The local newspaper ran editorials; the local medical association cited us for outstanding public service; the parents of the stricken children were lavish in their appreciation.

Overnight we achieved the general acceptance that we had been seeking for many, many months. And then the 2 cities began to use our rescue squad for all emergencies. Our battle for understanding was won. Today, we have 26 members, each highly skilled in rescue and first aid techniques. In fact, our men are creative, and, with the complete cooperation of the 32 doctors in our community, have worked out new first aid techniques and equipment with which to do a better job.

The employees of the company as well as the squad members feel that the company they work for is interested in the welfare of their family and neighbors not only at work but at home. This creates pride and a feeling of satisfaction that I don't believe can be obtained in any other manner.

### *Training a Key Factor*

There are several factors that are important in organizing a rescue squad. It takes more than equipment and the name and men. It takes training—hard training. The members must be trained and demonstrate a sincere interest in order to become a squad member. Proper selection must be made to eliminate those who merely enjoy blowing sirens. Only after a person performs under pressure will you know the individual and know his ability. He must train perpetually to keep abreast of new techniques.

The squad at the present time trained about 1,800 people including the twin cities police, fire department, and several industrial and civic groups. It conducts a radio program and instructs the citizens of the communities in how to take care of themselves in the event of emergency.

In my opinion, I do believe an industry has somewhat of an obligation in a small community to have that a group of this nature is organized, trained, and maintained to provide adequate service.

You folks carrying the brunt of the load of maintaining and improving the health in the rural areas of America—if you can encourage your local leaders to get behind a project like this, you may get the kind of citizen support you so richly deserve in your work of saving life and making a stronger America.

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## CDC Laboratory Refresher Training Courses

The Communicable Disease Center of the Public Health Service will give its annual laboratory refresher training courses in Chamblee, Ga., September 1955 through March 1956 according to the following schedule:

### Laboratory diagnosis of parasitic diseases:

Part 1. Intestinal parasites. September 12–October 7.

Part 2. Blood parasites. October 10–28.

### Laboratory diagnosis of bacterial diseases:

Part 1. General bacteriology. September 12–23.

Part 2. General bacteriology. September 26–October 7.

Enteric bacteriology. October 17–28.

Laboratory diagnosis of viral and rickettsial diseases. October 17–28.

Laboratory diagnosis of rabies. October 31–November 4.

### Laboratory methods in medical mycology:

Part 1. Cutaneous pathogenic fungi. October 31–November 11.

Part 2. Subcutaneous and systemic fungi.

(Part 1 or the equivalent is a prerequisite for this course.) November 14–25.

Laboratory diagnosis of tuberculosis. November 14–25.

Laboratory methods in the study of pulmonary mycoses. November 28–December 9.

Laboratory diagnosis methods in veterinary mycology. December 12–16.

Laboratory diagnosis of viral and rickettsial diseases. March 12–23.

Laboratory diagnosis of rabies. March 26–30.

By special arrangement the following courses will be offered:

Laboratory diagnosis of malaria.

Virus isolation and identification techniques.

Typing of *Corynebacterium diphtheriae*.

Special problems in enteric bacteriology.

Phage typing of *Salmonella typhosa*.

Information and application forms should be requested from Laboratory Training Services, Communicable Disease Center, Public Health Service, P. O. Box 185, Chamblee, Ga.

*Taking steps in the right direction, the Community Welfare Council of Milwaukee County has recently broadened the scope of its nurse recruitment program to include all auxiliary health professions. The council's Health Division Careers Committee is coordinating the recruitment efforts of 22 community organizations and health professions.*

## Milwaukee's Health Careers Committee

By EVELYN B. ROUSE, R.N., M.S., ALICE H. SANDERS, R.N., M.A.,  
and FLORENCE L. PHENIX, R.N., B.S.

AS MILWAUKEE's population has increased, there has been a growing concern over the inadequate number of hospital beds to serve the needs of this large population center. In November 1951 the United Hospitals Fund of Milwaukee County was established as a continuing organization to provide leadership in planning and financing needed hospital expansion.

Accompanying this upswing of interest in expansion of hospitals has been the concern expressed by hospital administrators and directors of nursing over the problem of staffing the proposed new facilities. Expansion of present facilities will, they maintain, only serve to aggravate the difficulties of trying to fill existing vacancies.

At the annual meeting of the Health Division of the Community Welfare Council of

Milwaukee County in 1950, its Medical Care Committee presented a panel discussion based on the committee's study of staff shortages as they affect nursing home and hospital services. The chairman introduced the discussion by likening medical care to a symphony orchestra with the physician as conductor: Just as the conductor is dependent on the members of his orchestra to produce the desired symphonic effects, he said, so the physician is dependent on the kind and amount of available staff to produce the desired results for his patients.

The panel reported the need for more workers to meet the current demands in nursing, anesthesia, laboratory and medical technology, and medical record library work. These shortages were illustrative of the current problems in other health fields, too, problems which would be accentuated with expansion of hospital and other community health facilities. The chairman, at the conclusion of the program, asked that thought be given to plans for the preparation of more workers to staff the present facilities and meet the demands of expansion.

As a result of the interest shown by increasing numbers of hospital administrators and service directors in the problems of staff shortages, the Milwaukee Hospital Council in September

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*Mrs. Rouse is the assistant director of nursing education, Deaconess Hospital School of Nursing, Milwaukee, and chairman of the Committee on Careers, Community Welfare Council of Milwaukee County. Mrs. Sanders is the health division secretary of the council, and Miss Phenix is associate secretary.*

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1951 instructed its Public Relations Committee to give attention to recruitment matters.

The committee learned that the National Nurse Anesthetist Association had 500 known vacancies in its field and no applicants in prospect. Wisconsin and Milwaukee had their proportionate share of this shortage as well as of the more drastic one in the nursing field. The Wisconsin State Department of Nursing had already reported a dropoff in enrollment in schools of nursing in the State, and Milwaukee nursing school statistics reflected this. Reversing this situation in the nursing schools and finding methods of increasing school enrollment in all of the health professions were essential steps in meeting the increasing service demands.

### Working With School Counselors

Taking note of the fact that high school guidance counselors are key persons in guiding young people in their choice of a profession, the public relations group met with counselors and representatives of universities and colleges and professional organizations to present the need for more workers in the health professions and to consider effective methods of recruiting young people for these professions.

When the counselors requested that more information be made available to them on the health specialties, they were informed that nursing was the only field for which material had been prepared.

The Wisconsin Medical Society Women's Auxiliary had assembled and placed in every high school of the State a notebook (1) outlining opportunities in the nursing profession. This brochure had been initiated by the Wisconsin State Board of Nursing and prepared and underwritten by the Wisconsin State Nurses Association. The counselors wanted similar material for the other health fields and also asked assistance in obtaining representatives of the various health fields as speakers.

These and other methods of making available to students factual information regarding fields of health service proved helpful.

The guidance counselors emphasized the need to avoid the element of competition among the various specialties. They explained that coun-

### Member Organizations

Milwaukee Public Schools; Milwaukee Institute of Technology; Hospital Council of Milwaukee County; Medical Society of Milwaukee County; Women's Auxiliary to the Medical Society of Milwaukee County; Kiwanis International, Wisconsin-Upper Michigan District; Milwaukee Advertising Club; Milwaukee League for Nursing; Wisconsin State Nurses Association, Milwaukee District; Wisconsin State Practical Nurses Association, Milwaukee District; Administrative Housekeepers Association;

Milwaukee County Dental Hygienists Association; Milwaukee Dietetic Association; American Physical Therapy Association, Wisconsin Chapter; Wisconsin Occupational Therapy Association; Wisconsin Association of Medical Technologists; Medical Library Association, Midwest Regional Group; Milwaukee Medical Record Librarians Association; Wisconsin Medical Record Librarians Association; American Association of Medical Social Workers, Wisconsin District; Wisconsin Pharmaceutical Association; Wisconsin Society of X-ray Technicians.

seling must be keyed to the interests and capacities of the individual and must not be distorted by competitive recruitment pressures. Basically sound guidance, they told us, gives the individual student information regarding the needs of the job, helps him identify his interests and determine what his capabilities best fit him to do.

The Public Relations Committee saw the careers pamphlet published by the Michigan State Medical Society (2) and agreed that a similar one keyed to Wisconsin needs would partly help in providing the material needed by the counselors. With the assistance and sponsorship of local and State medical and hospital groups, a brochure for Wisconsin (3) was developed and published in June 1953.

Three thousand copies were released to high school and college guidance counselors, libraries, and hospitals. Distribution outside Milwaukee County was handled through the



State medical society and the State hospital association and within the county by the county medical society and the local hospital council.

The interest of the Kiwanis Club in career days programs in the high schools was reported by a member of the hospital council who was also active in the club. Since these programs were an important potential for recruitment in the community, the council felt it desirable to maintain close association with the club's activities and appointed a representative for liaison between the two groups.

As the program of career days grew in the high schools, the use of speakers from the various professional fields increased. The Milwaukee League for Nursing developed a speakers bureau in order to handle requests for speakers in the nursing fields. Other professional groups made plans to follow suit.

### **The Recruitment Committee**

With the developing interest in nurse recruitment, the Community Nursing Council of the Milwaukee County Community Welfare Council had established a nurse recruitment committee in 1952. Its objective was the coordination of nurse recruitment efforts of the professional organizations with the work of other community groups interested in assisting with student nurse recruitment activities.

Membership of the Nurse Recruitment Committee included representatives from the nursing organizations, nurse executives from hospitals and agencies in the community, citizen leaders, representatives from the county medical society and its women's auxiliary, and spokesmen for the hospital council, the Kiwanis Club, and the public and private schools.

During the early days of the committee's organization it was somewhat difficult for the group to establish the understanding that its purpose was to give additional support to the professional organizations already actively working to relieve the nurse shortage and not to take over direct recruitment.

Some months later the group's function was clarified, and it began to make an increasingly important contribution to the recruitment efforts in the field of nursing.

About this time another conference for high

school guidance counselors was held under the joint sponsorship of the Nurse Recruitment Committee and the hospital council. Representatives of a number of the professional fields were present for discussion.

Following this meeting, the executive committee of the health division of the Community Welfare Council recommended that the committee's name be changed from Nurse Recruitment Committee to Recruitment Committee of the Health Division and that the renamed committee direct its attention toward coordination of recruitment efforts for all health service specialties.

The membership of the committee was then expanded to include 15 different health specialties and 7 civic and professional organizations functioning as channels of student recruitment for the health professions represented by the groups (see inset). The objective of the new committee remained that of synchronizing the recruitment efforts of professional organizations and coordinating the methods for getting career information to potential students.

The committee now faces a change in name again, to that of Careers Committee, as being more descriptive of its present activities. This seems to be more in keeping with its broadened scope and with its growing responsibility for interpretation of the various professional fields both to each other and to the public.

### **Effective Materials and Programs**

During the first year of its broadened functions (1954), the recruitment committee developed window displays for recruitment purposes, and it began developing and publishing recruitment materials for the use of committee members and their respective organizations. These materials are composite in nature, yet contain pertinent information about the individual health professions. They are intended to supplement—not duplicate—other available materials.

As of the present, the committee and its member organizations now have at their disposal the following pamphlets for career guidance as well as additional detailed recruitment materials published by the several professional organizations as part of their individual programs:



"In Planning Your Career Consider the Opportunities and Vast Fields Open to You as a Medical Associate," the brochure prepared for the use of vocational counselors and as library reference material (3).

"We Have Raised the Money for New Health Facilities, Now We Must Help Staff Them," a talk outline guide for adult groups such as parent-teacher associations (4).

"There's a Place on a Health Service Team for You," a pamphlet for student use, giving general information on 12 different health careers (5).

The recruitment committee is particularly fortunate in having good outlet representation among its members. Through their active interest and participation, much that is not necessarily a committee function has been accomplished.

For example—

The Milwaukee Advertising Club has given valuable assistance to the committee in the layout and editing of materials being developed for publication. The advertising club has helped arrange for newspaper space and radio time for spot announcements and has made it possible to obtain effective poster display materials.

The Women's Auxiliary of the Milwaukee County Medical Society has developed an active program of future nurse clubs and is promoting the interest of young people in professional preparation for health fields. This group has also provided scholarship assistance for nursing education.

### Assessment of Progress

Up to this point the values from the work of the recruitment committee have been apparent chiefly to its member organizations. The individuals comprising this multiprofessional group have gained greater understanding of the problems and the functions of the professions outside their own. There has been a stepping up of recruitment efforts on the part

of some of the member organizations as a result of the interest sparked by the committee's promotion activities.

Since the work of the committee represents a considerable expenditure of time as well as money from the member groups, it seems reasonable that some means of actual measurement of value should develop within the committee.

We can expect an increase in the number of enrollment applications in the Milwaukee and the State accredited schools which provide a curriculum of professional health training.

We have already observed an improvement of interprofessional understanding within the committee itself. The community value of this development will be in proportion to the degree of its reflection within the membership of the respective organizations.

As a corollary to the improvement of interprofessional understanding, the committee may expect to see increased community understanding of the contributions which the individual health professions make to the health needs of the community. This is a slow process but one which should make a constructive contribution.

### REFERENCES

- (1) Wisconsin State Nurses Association: Nursing brochure on recruitment. Madison, The Association, 1952.
- (2) Michigan State Medical Society: In planning your career consider the opportunities and vast fields open to you as a medical associate. Lansing, The Society, 1952.
- (3) Wisconsin State Medical Society: In planning your career consider the opportunities and vast fields open to you as a medical associate. Reproduced from the original brochure, Michigan State Medical Society (see ref. 2). Madison, The Society, 1953.
- (4) Milwaukee County Community Welfare Council. Health Division Careers Committee: We have raised the money for new health facilities, now we must help staff them. Milwaukee, The Council, 1954.
- (5) Milwaukee County Community Welfare Council. Health Division Careers Committee: There's a place on a health service team for you. Milwaukee, The Council, 1955.

# Functional Distribution of Working Time in Five County Health Departments

By EDWARD M. COHART, M.D., and WILLIAM R. WILLARD, M.D.

IN the fall and winter of 1952-53, the Yale Public Health Personnel Research Project conducted a time study in five county health departments in Maryland. As explained in a previous article (1), this study was designed to measure the allocation of time to technical activities (usually activities associated with direct services), ancillary activities (essential but usually routine, stereotyped activities), administration, and community activities. It was hoped that the data obtained, together with data collected through interviews, would provide new knowledge about the public health worker and his job.

Participating in the time study were 114 professional and semiprofessional workers—85 percent of those meeting the qualifications established by the Yale project (2). They were classified according to public health service, which was usually but not always synonymous with discipline, as follows: medical service, 8; nursing service, 71; sanitation service, 11; laboratory service, 3; secretarial service, 13; and other services, 8. Time logs were kept 2 days

each month for the 5-month period, September 1952 through January 1953. Different days of the week and different weeks of the month were chosen so that the data would be representative of the period. Information as to place in the administrative hierarchy, educational background, and salary was obtained through interviews. (Details of the methods used can be found in references 1 and 2.)

## The Working Day

The average daily elapsed time on the job, on the basis of a 5-day week, for all workers in the five county health departments was 8 hours and 41 minutes. An average of 57 minutes daily was spent in personal activities, such as meals, "coffee hours," rest periods, and sick leave. Thus, the effective working day was 7 hours and 44 minutes.

The average working day of 8 hours and 40 minutes for medical personnel was approximately an hour longer than the average working day of the personnel in the other services. As might have been anticipated, executive, supervisory, and consultant personnel worked longer hours than staff personnel.

For all personnel, the working time was allocated to the four functional categories as follows: 37 percent to technical activities, 33 percent to ancillary activities, 17 percent to administration, and 12 percent to community relations and organization. The time spent in these activities in relation to service affiliation, position in the administrative hierarchy, level

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*Dr. Cohart, associate professor of public health, Yale University School of Medicine, and Dr. Willard, dean of the College of Medicine at Syracuse, State University of New York, were co-directors of the Yale Public Health Personnel Research Project. The project was supported by research grants from the National Institutes of Health, Public Health Service, and the National Tuberculosis Association.*

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**Table 1. Percentage of working time devoted to each of 20 activity categories, by service, in five county health departments in Maryland**

Activity category	Service						
	Med- ical	Nurs- ing	Sanita- tion	Labora- tory	Secre- tarial	Other	All
Technical activities.....	28.4	40.5	51.6	54.2	5.7	41.7	37.2
Ancillary activities.....	10.4	29.1	31.1	42.9	79.1	22.9	33.2
Administration.....	34.2	17.5	7.7	2.4	6.1	20.9	16.5
Program planning within health department.....	8.1	4.5	1.8	0	.3	4.0	3.9
Giving supervision and training.....	11.6	6.8	2.9	1.3	1.4	5.5	6.0
Giving personnel supervision.....	6.5	3.9	1.4	1.3	1.4	3.8	3.5
Planning and giving individual inservice training.....	1.6	1.2	.6	0	0	.5	1.0
Planning and giving group inservice training.....	3.5	1.7	.9	0	0	1.2	1.5
Receiving supervision, education, and training.....	9.3	5.5	2.3	1.0	1.6	6.0	5.0
Supervision.....	.8	1.8	.3	0	1.2	.8	1.4
Education and training.....	8.5	3.7	2.0	1.0	.4	5.2	3.6
Management.....	5.2	.7	.7	.1	2.8	5.4	1.6
Personnel.....	2.5	.4	.1	0	.7	1.3	.6
Financial.....	.5	0	.2	0	1.0	1.8	.3
General services.....	2.2	.3	.4	.1	1.1	2.3	.7
Community relations and organization.....	25.2	11.9	6.1	.2	8.4	13.0	11.9
Activities with other agencies.....	20.6	6.4	3.7	0	.5	3.8	6.2
Joint program planning.....	11.3	4.4	2.1	0	.1	2.8	4.0
Activities with other agencies, except health depart- ments.....	5.3	1.9	1.0	0	.4	.9	1.8
Activities with other health departments.....	4.1	.1	.6	0	0	.1	.4
Public information and education.....	4.4	5.1	2.4	.2	7.9	6.4	5.2
Information services.....	.9	3.2	1.8	.2	7.4	2.1	3.2
Planning mass media.....	1.2	.8	0	0	.1	.8	.7
Talks to public.....	1.2	.5	.6	0	0	3.0	.7
Group organization.....	1.1	.6	0	0	.4	.5	.6
Giving professional education.....	.2	.4	0	0	0	2.8	.5
Social activities.....	1.6	1.0	3.3	.2	.8	2.5	1.3

of education and public health training, and salary is shown in the accompanying tables.

### Technical Activities

Personnel of the sanitation service devoted more time to technical, or direct service, activities than did the other health department workers. Whereas technical activities accounted for 37 percent of the time of all the workers, they absorbed more than 50 percent of the time of sanitation personnel, 40 percent of the nurses' time, about 30 percent of the time of medical personnel, and about 6 percent of the time of the secretarial group (table 1). It is surprising to find secretarial personnel engaged in technical services even to this limited extent

High-echelon personnel, with the exception of program directors and consultants, devoted much less time than did junior staff personnel to these activities (table 2). Twenty-five percent of the time of all high-echelon personnel was devoted to technical activities, as compared with 41 percent of the staff's time.

Level of education did not seem to be a major determining factor in the extent of participation in technical activities, but the amount of public health training was (tables 3 and 4). Whereas workers without graduate public health training spent about 39 percent of their time in technical activities, those with graduate public health training devoted only 24 percent of their time to these activities.

There was no correlation between salary and

percentage of time spent in technical activities (table 5).

### Ancillary Activities

Personnel of the nursing and sanitation services spent about 30 percent of their working time in performing ancillary, or supporting, activities, near the average for all personnel, but medical personnel spent only 10 percent of

their time in these activities (table 1). Secretarial personnel, even though all those whose work was entirely restricted to ancillary activities were excluded from the study, still spent about 80 percent of their time in these activities. It is evident, therefore, that even when a secretary has assumed nonsecretarial functions, she has done so on a rather restricted basis.

Staff-level personnel spent appreciably more time in ancillary activities than did personnel

**Table 2. Percentage of working time devoted to each of 20 activity categories, by administrative level, in five county health departments in Maryland**

Activity category	High-echelon personnel						Staff-level personnel		
	Health officer and assistant health officer	Program director and assistant program director	Administrative assistant	Consultant	Supervisor	All high-echelon personnel	Senior staff	Junior staff	All staff-level personnel
Technical activities-----	16.4	41.5	6.9	36.4	19.7	25.3	26.3	43.3	40.9
Ancillary activities-----	14.8	11.0	17.0	12.9	22.2	16.9	30.3	39.8	38.4
Administration-----	38.1	32.7	58.9	31.4	42.0	38.3	19.6	7.9	9.5
Program planning within health department-----	7.9	8.0	9.7	8.5	10.1	9.0	11.4	.8	2.2
Giving supervision and training---	14.7	12.4	10.2	10.2	22.6	16.6	3.3	2.6	2.6
Giving personnel supervision---	8.1	6.1	10.2	5.7	16.3	10.8	.2	1.4	1.2
Planning and giving individual inservice training-----	2.3	1.2	0	1.0	4.1	2.5	1.2	.4	.5
Planning and giving group inservice training-----	4.3	5.1	0	3.5	2.2	3.3	1.9	.8	.9
Receiving supervision, education, and training-----	8.5	8.6	3.9	11.5	5.5	7.5	4.9	4.0	4.2
Supervision-----	1.2	3.8	1.2	.4	2.3	2.0	1.3	1.2	1.2
Education and training-----	7.3	4.8	2.7	11.1	3.2	5.5	3.6	2.8	3.0
Management-----	7.0	3.7	35.1	1.2	3.8	5.2	0	.5	.5
Personnel-----	3.4	2.4	8.1	.5	1.8	2.2	0	.1	.1
Financial-----	.9	.3	11.8	0	0	.7	0	.2	.2
General services-----	2.7	1.0	15.2	.7	2.0	2.3	0	.2	.2
Community relations and organization-----	28.8	12.1	14.2	16.4	14.6	17.0	23.4	7.8	10.0
Activities with other agencies-----	27.0	7.6	0	9.6	7.6	11.3	1.3	5.1	4.6
Joint program planning-----	12.0	4.8	0	8.2	6.7	7.3	.9	3.3	3.0
Activities with other agencies, except health departments---	8.1	1.0	0	1.2	.9	2.3	.2	1.8	1.6
Activities with other health departments-----	6.9	1.8	0	.2	0	1.7	.2	0	0
Public information and education---	1.8	4.2	14.2	4.9	6.1	5.0	20.5	2.5	5.0
Information services-----	.5	1.9	.8	.4	2.9	1.8	14.4	1.8	3.6
Planning mass media-----	.2	0	0	2.5	1.5	1.0	3.1	.1	.5
Talks to public-----	.2	2.2	13.4	.8	1.1	1.6	.1	.4	.4
Group organization-----	.9	.1	0	1.2	.6	.6	2.9	.2	.5
Giving professional education-----	0	.3	0	1.9	.9	.7	1.6	.2	.4
Social activities-----	1.9	2.5	3.0	2.9	1.5	2.1	.5	1.2	1.1

**Table 5. Percentage of working time devoted to each of 20 activity categories, by annual salary level, in five county health departments in Maryland**

Activity category	\$2, 000- \$2, 999	\$3, 000- \$3, 999	\$4, 000- \$5, 999	\$6, 000 and over
Technical activities---	27. 7	40. 8	27. 8	37. 3
Ancillary activities---	61. 3	36. 1	21. 6	11. 5
Administration-----	2. 7	11. 9	33. 2	28. 4
Program planning within health de- partment-----	. 1	2. 7	8. 4	6. 7
Giving supervision and training---	1. 4	3. 7	14. 4	9. 5
Giving personnel supervision---	1. 4	2. 0	9. 1	5. 3
Planning and giving individ- ual inservice training-----	0	. 6	2. 6	1. 3
Planning and giving group inservice train- ing-----	0	1. 1	2. 7	2. 9
Receiving supervi- sion, educa- tion, and train- ing-----	. 8	4. 7	6. 4	7. 8
Supervision-----	. 3	1. 4	2. 1	. 6
Education and training-----	. 5	3. 3	4. 3	7. 2
Management-----	. 4	. 8	4. 0	4. 4
Personnel-----	0	. 2	1. 9	2. 0
Financial-----	. 1	. 2	. 8	. 6
General services---	. 3	. 4	1. 3	1. 8
Community relations and organization---	7. 8	10. 2	14. 2	21. 0
Activities with other agencies---	2. 4	5. 0	6. 6	16. 9
Joint program planning-----	. 2	3. 4	5. 1	9. 3
Activities with other agencies, except health departments---	2. 2	1. 6	1. 0	1. 2
Activities with other health departments---	0	0	. 5	3. 4
Public information and education---	5. 4	4. 9	5. 8	3. 9
Information serv- ices-----	5. 3	3. 4	2. 5	. 8
Planning mass media-----	0	. 5	1. 1	1. 1
Talks to public---	0	. 4	1. 7	1. 1
Group organiza- tion-----	. 1	. 6	. 5	. 9
Giving professional education-----	0	. 3	1. 8	. 2
Social activities-----	. 3	1. 0	3. 0	1. 5

most all of it in activities with other agencies.

An unexpected finding was the fact that workers with bachelor's degrees and those with undergraduate public health training tended to participate in community activities to a lesser extent than did workers without a college degree or formal public health training (tables 3 and 4). This situation was, in large measure, a result of their spending less time in activities related to public information and education. Personnel with graduate education and those with graduate public health training, on the other hand, engaged in community activities to a much greater extent than either of the other two classes of personnel, principally because of their extensive activities with other agencies.

Time devoted to community activities varied directly with salary, primarily because the top-salaried workers engaged in activities with other agencies to a much greater extent than did the other personnel (table 5). Their participation in public information and education and in professional education was generally not as extensive as that of the workers in other salary brackets.

### Salient Patterns

From this study of the distribution of working time in five county health departments in Maryland, a number of patterns are evident. These relate to the differences according to service affiliation, administrative and educational levels, and salary.

Physicians and personnel at the higher levels of the administrative hierarchy tended to spend less than the average percentage of time in technical, or direct service, activities and in ancillary, or supporting, activities. On the other hand, relatively large segments of their time were devoted to activities in administration and community relations and organization.

While no clear-cut association was shown to exist between salary and participation in technical activities, a negative association between salary and participation in ancillary activities and positive associations between salary and participation in administrative activities and community relations and organization were found. In general, similar associations were found for level of education and public health training.

Thus, the picture that emerges is one in which relatively greater emphasis is placed on administrative and community activities by personnel on the higher rungs of the administrative ladder and in the higher salary brackets and by those who have had more education, both generally and specifically in public health, than by other personnel. However, staff-level personnel, those with less education, and workers in the lower salary brackets are nevertheless making major contributions to these activities since they constitute the larger proportion of health department personnel.

In view of these findings, a question that should be asked is: Is the preparation of public health workers, in terms of specific education and training, for administration and community relations and organization adequate? The findings that emerged from other portions of the Yale study would seem to indicate that this question should be answered in the negative. At least, it is a question that warrants attention.

As an example of the differences in patterns of activity among the several services, it will be recalled that the sanitation personnel devoted more time than the nursing personnel to technical activities, whereas the reverse was true with respect to administrative activities and community relations and organization. Why do these differences exist? Are the nurses failing to discharge satisfactorily all of their direct service responsibilities and overemphasizing administrative and community activities, especially supervision and inservice training? Or, are sanitation personnel failing to give proper emphasis to inservice training, for example? Or, is the present distribution of time by each service entirely appropriate to the nature and responsibilities of the service? In

order to determine which of these explanations is correct, an intensive evaluative case study of these health departments would have to be made. A time study can be of value to any individual agency only when it is combined with a qualitative case study.

In the health departments studied, public health is roughly one-third technical activities, one-third ancillary activities, one-sixth administration, and one-eighth community relations and organization. If the assumption is made that ancillary activities support the administration and community organization activities and the technical activities almost equally, and this assumption cannot be too far from the truth, then it can be said that roughly half of the health department time is devoted to administration and community activities and the other half to activities that provide direct service. A question that can be asked here is: Is this distribution of time proper? The answer will depend upon two major considerations: (a) the basic philosophy of public health under which the organizations operate and (b) the character of the communities involved and the nature of their health problems.

Finally, we should like to call special attention to the finding that ancillary activities consumed one-third of the health department time. This finding is more than food for thought; it is, we believe, an indication for a searching re-examination of public health practices.

#### REFERENCES

- (1) Cohart, E. M., and Willard, W. R.: A time-study method for public health—The Yale study. *Pub. Health Rep.* 70: 570-576, June 1955.
- (2) Cohart, E. M., Willard, W. R., and Hiscock, W. McC.: A method for studying the public health worker and his job—The Yale study. *Pub. Health Rep.* 70: 447-452, May 1955.



two or three decades of the usual lifetime, whereas women have a higher rate during the childbearing years. In fact, at about age 35, approximately twice as many women as men are found to have a malignant tumor. After the childbearing period, however, the rate for males catches up with and exceeds the rate for females.

4. In women, nearly half of all cancers originate in the reproductive organs and nearly one-fourth, in the digestive system. Among men, the reproductive organs account for only one in eight cancers, whereas one-third originate in the digestive system.

5. The reported incidence of cancer in the nonwhite population is less than two-thirds of

that for the white group, a difference due largely to the lower susceptibility of Negroes to skin cancer (one of the more common neoplasms among white persons). However, the age-adjusted mortality rates are almost identical for both races.

6. The chance of developing cancer is about one-third greater for white persons living in the south and the west than for those living in the north, due in large measure to the higher incidence of skin cancer in these areas. Twenty-eight percent of newly diagnosed cases of cancer among white persons living in the south originate in the skin; corresponding percentages for the west and north are 20 and 10, respectively.

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### *Emergency Mental Care*

MONTGOMERY COUNTY, MD. alarmed at the number of mental patients being put into the county jail pending medical care, Montgomery County, Md., now provides temporary care in the psychiatric unit of a local hospital.

The community considers this solution a workable plan but one which still needs legal clarification, a more satisfactory arrangement for the highly disturbed patient, and still further study.

The problem, as it existed in 1951, had many aspects. The sudden onset of mental illness presented a baffling situation to the community, local police, and other authorities. Its occurrence at night or on weekends created a special emergency. The jail had only cells and detention rooms for the general handling of prisoners. Yet there was the possibility that the emergency patient

might become unmanageable and dangerous before he could be placed under control. Often he had no family or friends to help him or to find a resource to care for him. The easiest way out had been to place him in jail.

Psychiatrists studied the problem, and likewise many local groups gave it their attention and understanding. Representatives of these groups were brought together in an official committee in order to define the areas of difficulty in the proper handling of emergency cases. The health department arranged and coordinated the many meetings and conferences, helped in locating possible facilities and in providing consultants.

The committee first worked out a temporary arrangement whereby health department nurses served on a 24-hour emergency standby basis, working with police, local physicians, and State mental hospitals to find a satisfactory solution for each individual patient.

In 1953, when a local general hospital opened a unit exclusively for the treatment of mentally ill patients, the police no longer had to call the emergency duty nurse when

they were faced with an emergency situation.

Instead, if no private source of care is practical or available, they call the supervising nurse of the psychiatric unit of the hospital. The situation is explained, and the nurse, after consultation, if necessary, with the psychiatrist on call, decides on the best procedure.

If the patient is dangerous, she may recommend the use of the police to bring him to the hospital, where he can be seen by a psychiatrist.

If the patient is a parolee from a mental hospital, the nurse may call the hospital to arrange for his immediate readmission.

If the patient needs local overnight care, he may be admitted to the psychiatric unit of the hospital.

If the patient is medically indigent, the county can remunerate the hospital for either outpatient or inpatient care.

—*Reported by Dr. Eugene H. Guthrie, Public Health Service, and Dr. Valcoulon L. Ellicott, respectively the former public health resident and the former county health officer, Montgomery County, Md.*

# Responses to Smallpox Vaccination in Military Recruits

By SUNG J. LIAO, M.D.

THE IMMUNITY of young men to contagious diseases is being studied in a group of recruits from the Army, the Navy, and the Air Force, and preliminary and secondary reports of a survey of this group carried out during April-June 1951 have been submitted to the Surgeon General of the Army. These reports include details of the manner in which the vaccination survey was conducted and definitions of the geographic divisions of this country and of the home communities of the recruits. Reports have been published on the results of Schick tests in relation to geographic origin and residence (1) and on the results of mumps complement fixation tests (2).

The survey reported here was carried out to determine the results of smallpox vaccination as practiced by the Armed Forces under conditions existing in early 1951 and to consider how such measurements can be used as a national index of certain vaccination practices. It was felt that this group, although subject to some bias in its selection, was nevertheless quite

representative of the population of the Nation. The study does not, of course, represent an investigation to determine how thoroughly all young adult males of this country have been vaccinated.

A number of attempts have been made to review the extent of mass immunity against smallpox in the population of this country. Collins (3) found that, for the 4-year period 1928-31, 54 percent of almost 40,000 individuals of all ages residing in various parts of this country had been vaccinated. Of the males in his series, 65 percent of 2,415 individuals aged 15-24 years had been vaccinated, and 4 percent of the same group stated that they had had a clinical attack of smallpox.

Bull and Rankin (4) analyzed the records of 5,488 students who were vaccinated between 1924 and 1936 after admission to Lehigh University. Only 193 (3.5 percent) had not been vaccinated before entering the university, and 7.5 percent of the entire group gave a primary reaction to vaccination. Loy and Husband (5, 6), in 1936 and 1937 found that 75 percent and 78 percent of two groups of students of about 1,000 each had been vaccinated before entering another university. They came mainly from rural areas and small towns of Kansas. About 60-65 percent of them were considered "susceptible to vaccination," as shown by a primary or a vaccinoid reaction.

More recent information on the response to smallpox vaccination of the general population of this country is rather fragmentary. I have been unable to find a report based on data collected within the past 20 years on a nationwide

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*Dr. Liao, an assistant professor of preventive medicine at Yale University School of Medicine at the time this study was made, is at present a fellow in training in physical medicine at the Massachusetts General Hospital, Boston, Mass. The work reported was done under the auspices of the section of preventive medicine, Yale University School of Medicine, for the Commission on Virus and Rickettsial Diseases, Armed Forces Epidemiological Board, with the assistance of officers of the Armed Forces.*

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basis; therefore, the results of the present study might be considered to be a progress report on a national basis.

The manner in which this vaccination survey was conducted has been similar to that recorded in earlier reports to the Surgeon General of the Army. All of the recruits were males. The only criteria of selection were: (a) that the recruit be able to recall whether or not he had been vaccinated before admission to the military services and, if so, when; and (b) that the results of the current vaccination could be evaluated by the group making this study. Throughout this paper, the term "current vaccination" is used to mean the smallpox vaccination done by Armed Forces personnel when this survey was conducted in 1951.

About 95 percent of the entire group examined were between 17 and 22 years of age. The recruits came chiefly from the North Central and the Southern States and were more or less evenly distributed among urban, town, and rural communities. All were apparently in good health and none reported a clinical attack of smallpox.

### Smallpox Vaccination

The recruits who were entering the Army, the Navy, or the Air Force, were vaccinated at the processing centers when they were inducted—2 to 7 days, usually 4 days—prior to their arrival at the training camps where the surveys were conducted. These training camps were: Fort George G. Meade, Md.; Aberdeen Proving Grounds, Md.; Lackland Air Force Base, Texas; and Great Lakes Naval Training Center, Ill. The actual vaccination procedure was carried out by medical personnel of the Armed Forces. The vaccination responses were read by a group of third- and fourth-year medical students from the Yale University School of Medicine and were recorded twice. The first reading was usually taken 5 to 9 days after the vaccination and the second reading, 4 days later. These readings were often supplemented by examining the immunization records of the recruits for reports of earlier readings made by others during the current period of observation.

Classification of the responses to smallpox

vaccination was that recommended by Leake (7) and readings were evaluated, in relation to the time of vaccination, as "primary," "accelerated," and "immune" reactions. The corresponding terms preferred by some authors to describe similar types of responses to smallpox vaccination are "vaccinia," "vaccinoid," and "immediate" reactions. Each time the responses were read, measurements of the erythematous area were taken carefully, and the character and size of the vesicle or pustules were recorded.

In interpreting vaccination results, only the primary reaction was considered to be an indication of lack of specific immunity (8). No emphasis was laid on the accelerated and immune reactions for a number of reasons, some of which have been emphasized by Morgan and Haselb (9). These authors have indicated that possible erroneous results may be due to differences in the skill of the operator and to the potency of vaccine lymphs. They suggested that such variations are even more important in revaccinations than in primary vaccinations. In line with these observations are those of Benenson, Kempe, and Wheeler (10), who demonstrated that even an inactivated lymph (containing no live vaccinia virus) could give accelerated or immune reactions in repeatedly vaccinated persons similar to the reaction induced by potent lymph, although the inactivated lymph could not provoke a rise of complement-fixing antibodies or hemagglutination inhibiting antibodies characteristic of the potent lymph.

### Results

In the evaluation of readings at the first interview during the immunity survey, 2,682 individuals were questioned with regard to their histories of previous smallpox vaccinations. The interview was usually supplemented by an examination for vaccination scars. Almost 10 percent had never been vaccinated before entering military service (table 1). About one-half had been vaccinated more than 10 years previously and almost one-third, within the last 10 years. Few could recall having been vaccinated more than once. None reported a clinical attack of smallpox.

**Table 1. History of previous smallpox vaccination and evaluability of vaccination in 2,682 military recruits**

History of previous vaccinations	Total recruits interviewed		Results of current vaccination			
			Not evaluable		Evaluable	
	Number	Percent <sup>1</sup>	Number	Percent <sup>1</sup>	Number	Percent <sup>1</sup>
Total-----	2, 682	100. 0	393	14. 65	2, 289	85. 35
>10 years <sup>2</sup> -----	1, 510	56. 30	213	7. 94	1, 297	48. 36
<10 years <sup>3</sup> -----	882	32. 88	122	4. 55	760	28. 33
Never before <sup>4</sup> -----	258	9. 62	52	1. 93	206	7. 69
Unknown <sup>5</sup> -----	32	1. 20	6	. 23	26	. 97

<sup>1</sup> All percentages are based on the total of 2,682.

<sup>3</sup> Vaccinated within the last 10 years.

<sup>2</sup> Vaccinated more than 10 years previously.

<sup>4</sup> Never vaccinated before induction into military service.

<sup>5</sup> Could not remember whether or not he had been vaccinated before.

The results of the current vaccination program in 393 recruits (15 percent of the entire group) could not be satisfactorily evaluated for various reasons. The major reason for the loss of these men from the series was that a good proportion of them were not vaccinated after entering military service. Another group of recruits reported that they had been vaccinated, although the results were not marked on their immunization records nor was any scarring detectable. A very few were absent at the second reading of the vaccination responses, either because of sickness or for other causes. Among those whose vaccination results could be evaluated, 26 persons could not give a definite statement about their previous smallpox vaccination. Thus, excluding the 419 individuals in these

two categories, only 2,263 military recruits were included in the subsequent analyses.

Table 2 summarizes the history of previous vaccinations and the results of the current vaccination. About 18 percent of the entire group gave a primary reaction; 48 percent, an accelerated reaction; and 33 percent, an immune reaction. Among those who had never been vaccinated before, 85 percent gave a primary reaction. A higher percentage of primary reactors were observed among those who had been vaccinated more than 10 years previously than among those who had been vaccinated within the last 10 years, although the difference was not remarkable.

Distribution of the previously unvaccinated recruits according to their geographic origins

**Table 2. History of previous smallpox vaccination and result of current vaccination of 2,263 military recruits**

Previous vaccination history	Vaccinated recruits with definite history of vaccination	Reaction to vaccination					
		Primary		Accelerated		Immune	
		Number	Percent <sup>1</sup>	Number	Percent <sup>1</sup>	Number	Percent <sup>1</sup>
Total-----	2, 263	415	18. 3	1, 105	48. 4	760	33. 3
>10 years <sup>2</sup> -----	1, 927	163	12. 6	727	56. 0	407	31. 4
<10 years <sup>3</sup> -----	760	76	10. 0	343	45. 1	341	44. 9
Never before <sup>4</sup> -----	206	176	85. 5	<sup>5</sup> 25	12. 1	<sup>5</sup> 5	2. 4

<sup>1</sup> Percentage of total in each history group

<sup>2</sup> Vaccinated more than 10 years previously.

<sup>3</sup> Vaccinated only once in the military services.

<sup>4</sup> Vaccinated within the last 10 years.

<sup>5</sup> Never vaccinated before induction.

Whether a different response could be obtained by further repeated vaccination was not investigated.

**Table 3. Percentage distribution of 2,263 military recruits reporting no smallpox vaccination before induction, by type of community and geographic area of residence**

Type of community	Total		Geographic area							
			Northeast		North Central		South		West	
	Number interviewed	Percent never vaccinated	Number interviewed	Percent never vaccinated	Number interviewed	Percent never vaccinated	Number interviewed	Percent never vaccinated	Number interviewed	Percent never vaccinated
Total.....	2,263	9.1	293	2.7	920	10.5	923	9.3	127	11.8
Urban.....	798	4.8	189	1.6	342	7.0	241	2.9	26	15.7
Town.....	839	9.4	86	4.6	349	10.9	356	8.2	48	16.7
Rural.....	626	14.2	18	5.6	229	15.3	326	15.7	53	5.6

and domiciliary communities is shown in table 3. Of the 293 persons from the Northeastern States, only 8 (2.7 percent) had never been vaccinated prior to induction. These 8 were more or less evenly distributed among urban, town, and rural districts. The occurrence of such a distribution by chance was approximately 1 in 3, with  $\chi^2=1.35$ .

Nine hundred twenty recruits came from the North Central States. Almost 11 percent had never been vaccinated previously. More, previously unvaccinated, recruits from the North Central region came from rural areas than from urban communities. The difference was statistically significant ( $\chi^2=10.3$  and  $p=1$  in 1,000, approximately).

Nine hundred twenty-three recruits came from the Southern States; 9 percent had never

been vaccinated before. In these States, more of the unvaccinated recruits had lived in rural areas than in urban communities. The difference was statistically significant ( $\chi^2=23.7$  and  $p<1,000$ ).

The number of recruits from the Western States was too small to subject to critical analysis.

The distribution of recruits with primary reactions to the current vaccination is shown in table 4.

Eighteen percent of the recruits from the Northeast gave a primary reaction; corresponding figures for the North Central States, the South, and the West were 19 percent, 18 percent, and 14 percent, respectively. There was no significant difference among the four geographic areas in the proportions of recruits

**Table 4. Percentage distribution of primary reaction of 2,263 military recruits to current smallpox vaccination, by geographic origin and type of home community**

Geographic origin	Total		Type of community					
			Urban		Town		Rural	
	Number examined	Percent primary reactions <sup>1</sup>	Number examined	Percent primary reactions <sup>1</sup>	Number examined	Percent primary reactions <sup>1</sup>	Number examined	Percent primary reactions <sup>1</sup>
Total.....	2,263	18	798	15	839	19	626	22
Northeast.....	293	18	189	19	86	20	18	11
North Central.....	920	19	342	15	348	19	229	25
South.....	923	18	241	11	356	19	326	23
West.....	127	14	26	15	48	19	53	9

<sup>1</sup> Percentage based on number of examined recruits in each region.

with a primary reaction to the current vaccination.

Fifteen percent of the urban recruits, 19 percent of the town recruits, and 22 percent of the rural recruits gave a primary reaction to the current vaccination. The difference in percentage of primary reactions in recruits from urban communities and from rural areas was statistically significant ( $\chi^2=14.2$  and  $p<1$  in 1,000).

The percentage distribution of primary reactions among the recruits in individual States or groups of States is shown in table 5. The percentages regarded as significant varied from 5 to 27 percent. Factors responsible for the high values are probably multiple.

**Table 5. Percentage of primary reactors to smallpox vaccination of 2,259<sup>1</sup> military recruits, by individual States or groups of States**

States or groups of States	Number in study	Percent primary reactors
New England States.....	72	22
New York and New Jersey.....	112	12
Pennsylvania.....	109	21
Maryland, Delaware, Virginia, West Virginia, and District of Columbia.....	80	20
North and South Carolina.....	175	5
Georgia and Florida.....	79	15
Alabama.....	77	22
Kentucky.....	90	12
Tennessee.....	84	25
Ohio.....	234	27
Michigan.....	168	13
Indiana.....	70	23
Illinois.....	150	17
Wisconsin.....	58	7
Minnesota.....	124	18
North and South Dakota.....	<sup>2</sup> 39	<sup>2</sup> 26
Oklahoma, Kansas, and Iowa.....	<sup>2</sup> 21	<sup>2</sup> 43
Mississippi, Arkansas, and Louisiana.....	121	26
Missouri.....	64	12
Texas.....	205	22
Arizona and New Mexico.....	<sup>2</sup> 21	<sup>2</sup> 14
Colorado, Utah, and Nevada.....	<sup>2</sup> 23	<sup>2</sup> 9
Montana, Idaho, and Wyoming.....	<sup>2</sup> 23	<sup>2</sup> 23
Washington, Oregon, and California.....	<sup>2</sup> 60	<sup>2</sup> 13
Total.....	2,259	18

<sup>1</sup> For 4 of the original recruits, data on "home State" were not available.

<sup>2</sup> Results probably not representative, because of the small numbers of recruits included.

Twenty years ago, Collins (3) found that 65 percent of 2,415 males aged 15-24 years had been vaccinated and 4 percent reported that they had had smallpox. From our survey, it appeared that in 1951 the situation had been

improved—approximately 90 percent of a somewhat similar age group of males (17-22 years) had been vaccinated and none reported an attack of the disease.

From our interviews with these military recruits, the impression was gained that fewer young adult males from the Northeastern States (3 percent) had not been vaccinated before entering the armed services than had those from other parts of the country—North Central, 11 percent; South, 9 percent; and West, 12 percent. Nevertheless, similar proportions of primary reactions were obtained from each of these four geographic regions.

When rural and urban communities were compared, it was found that more of the recruits from rural areas gave a primary reaction than did those from urban communities. Assuming that vaccination was performed with equal skill in both rural and urban localities, this difference could be taken merely to reflect the fact that more of the rural recruits than urban recruits had never been vaccinated before entering military service.

Because of the very nature of the population included in this survey, these results should not be taken to indicate the immunity status of the population of the United States as a whole. Nevertheless, it represents the type of survey that it is desirable to conduct from time to time to serve as an index of the general effectiveness with which vaccination against smallpox is being practiced on a regional basis throughout the country.

## Summary

This survey concerns the response to vaccination as performed by Armed Forces medical personnel on United States military recruits who were vaccinated and examined at the time of their induction into the services in 1951.

Almost 2,700 male recruits, the majority aged 17-22 years, were interviewed as to their history of previous smallpox vaccination, and their responses to the current smallpox vaccination were recorded.

About 10 percent of this nationwide sample had never been vaccinated before. None reported a previous attack of smallpox. Fewer recruits from the Northeastern States than from

other parts of the country had never been vaccinated before. More recruits from rural areas than from urban communities had never been vaccinated previously.

About 18 percent of 2,263 recruits gave a "primary" reaction to the current vaccination. Of those who had never been vaccinated before, about 85 percent gave a primary reaction. More primary reactions were observed among those who had been vaccinated 10 years ago than among those who had been vaccinated within the last 10 years. However, the difference was not remarkable.

There was no difference in the proportion of primary reactions among recruits from the four geographic regions of the United States.

The percentage of primary reactions among recruits from individual States or groups of States varied from 2 percent to 26 percent.

#### ACKNOWLEDGMENT

Nine students (now doctors) from the Yale University School of Medicine were responsible for reading the vaccination results: H. M. Goldberg, A. S. Kaplan, A. D. Katz, R. D. King, J. K. Luce, R. B. Schmitz, H. M. Sterling, W. A. Taylor, and J. Walker.

#### REFERENCES

- (1) Liao, S. J.: Immunity status of military recruits in 1951 in the United States. I. Results of Schick test. *Am. J. Hyg.* 59: 262-272, May 1954.
- (2) Liao, S. J., and Benenson, A. S.: Immunity status of military recruits in 1951 in the United States. II. Results of mumps complement fixation test. *Am. J. Hyg.* 59: 273-281, May 1954.
- (3) Collins, S. D.: History and frequency of small-pox vaccinations and cases in 9,000 families. *Pub. Health Rep.* 51: 443-479, April 17, 1936.
- (4) Bull, R. C., and Rankin, S. L.: Smallpox immunity in 5,000 college students. *Pub. Health Rep.* 51: 734-747, June 5, 1936.
- (5) Husband, M. W., and Loy, D. T.: Immunity to smallpox. *J. A. M. A.* 109: 1797-1798, November 27, 1937.
- (6) Loy, D. T., and Husband, M. W.: Duration of smallpox immunity. *J. A. M. A.* 111: 780-781, August 27, 1938.
- (7) Leake, J. P.: Questions and answers on smallpox and vaccination. *Pub. Health Rep.* 42: 221-238, January 28, 1927.
- (8) Conybeare, E. T.: Smallpox in vaccinated. *Practitioner* 157: 191-199, September 1946.
- (9) Horgan, E. S., and Haseeb, M. A.: Revaccination as a measure of immunity to smallpox. *J. Hyg.* 43: 337-340, April 1944.
- (10) Benenson, A. S., Kempe, C. M., and Wheeler, R. E.: Problems in maintaining immunity to smallpox. *Am. J. Pub. Health.* 42: 535-541, May 1952.

### Legal Note—Liability for Pooled Blood Plasma

The New York Court of Claims recently held that the State of New York is not civilly liable for the death of a hospital patient who died from homologous serum hepatitis which he developed as a result of a nonemergency transfusion of pooled unirradiated blood plasma. The plasma had been distributed to the hospital, free of charge, by the State of New York. *Hidy v. State of New York*, 137 NYS 2d 334 (Ct. Claims, N. Y., 1955).

The court held that the State was under no duty to affix warning labels to the plasma containers nor to distribute literature concerning the dangers of pooled blood since such information was readily available to practitioners through the professional journals. The Appellate Division of the New York Supreme Court has previously held that the State cannot be held liable for the death of a patient when the contaminated blood plasma is administered under emergency conditions where "safer" types of transfusion material are not available. *Parker v. State*, 280 App. Div. 157, 112 NYS 2d 695 (1952), leave to appeal denied 304 NY 989, 109 NE 2d 474.

# DDVP . . .

## The New Insecticide's Present Status

By KENNETH D. QUARTERMAN, B.S., M.P.H.

THE DISCOVERY of dimethyl 2,2-dichlorovinyl phosphate, a new and potent insecticide known as DDVP, was announced February 1, 1955, by the Secretary of Health, Education, and Welfare. The new organic phosphorus compound was developed by chemists on the Savannah, Ga., laboratory staff of the Public Health Service's Communicable Disease Center. Preliminary tests have proved the compound to be about equally as toxic to houseflies as parathion, but only one-fifth to one-tenth as toxic to rats as parathion.

Since the discovery announcement, subsequent publicity unfortunately has, to some extent, overemphasized the presently apparent potentialities of this new insecticide. At the same time, little or no information has been given to the public as to its availability. The Public Health Service has received many inquiries for information on uses, costs, manufacture, and distribution of DDVP.

DDVP is not now being produced commercially and is not available for use by the general public. Before it can be released for general use, much investigation is needed to determine dosage requirements for specific insects, suitable formulations, and the toxicological hazards associated with its usage. Considerable time will be required to develop such information and to register labels with the United

States Department of Agriculture as required by the Federal Insecticide, Fungicide, and Rodenticide Act.

### Invention for Public Use

It has been determined that the Federal Government is entitled to the entire right, title, and interest in the invention of DDVP. It was decided also that the Government should not seek to obtain a domestic patent on the invention because prior publications on the invention by the Government scientists who developed it are deemed sufficient protection against the prosecution of a successful patent application by a later inventor. These publications will, within 1 year from the first date of publication, constitute a dedication of the invention to the public. Such a dedication adequately protects the interests of the Government. On the basis of this determination and decision, any manufacturer who wishes to do so may proceed with the domestic production of DDVP in the United States without seeking a license from the Government.

### Manufacture of DDVP

A number of chemical manufacturers have expressed an interest in producing DDVP. How many companies may ultimately engage in its manufacture cannot be determined at this time, and the number undoubtedly will be governed by the demand for the product. At the present time, only one company is known to have a pilot plant in operation. The limited quantities of DDVP being produced are available only to qualified research units for further study and field evaluation against a variety of insects. Until DDVP is produced commercially, estimates concerning its cost are impractical.

### Extent of Usefulness

What insects DDVP may prove useful in controlling cannot be predicted accurately. Be-

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*Mr. Quarterman, a biologist, is chief of the Technical Development Laboratories, Technology Branch, Communicable Disease Center, Public Health Service, Savannah, Ga.*

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cause of its chemical properties and the present knowledge of its insecticidal activity and toxicity to warm-blooded animals, it appears that DDVP is apt to find only limited use against insects of public health significance. It has been shown to be effective on DDT-resistant houseflies by topical application (1) and in poison baits (2). It may be reasonable to expect that DDVP will be useful in such situations as outdoor space sprays to control adult flies and mosquitoes. There also may be some usage for it as a larvicide against flies and mosquitoes. Because of its relatively high volatility, DDVP is not likely to be useful as a residual spray; and because of its toxicity, it appears unsuitable for use in vaporizers in occupied buildings.

DDVP should find wider use in agriculture than in public health. It should be effective against many of the agricultural pests now controlled with parathion and tetraethylpyrophosphate (TEPP). Since DDVP appears to be considerably less toxic than these compounds, and since it will offer less residue problem on food crops than many other insecticides now in use, it is reasonable to anticipate considerable

usage of DDVP in agriculture, especially on food crops.

In summary, DDVP is a promising new insecticide, the full potentialities of which remain to be developed by further research, much of which is already in progress. It is not available to the public and is not likely to be before 1956, at the earliest. The Government has dedicated the discovery of DDVP to the public; and any manufacturer may engage in its production in the United States without obtaining a license from the Government. Its sale in this country, of course, will be subject to compliance with the requirements of the Federal Insecticide, Fungicide, and Rodenticide Act as are all other insecticides.

#### REFERENCES

- (1) Mattson, A. M., Spillane, J. T., and Pearce, G. W.: Organophosphorus insecticides. Dimethyl 2,2-dichlorovinyl phosphate (DDVP), an organic phosphorus compound highly toxic to insects. *J. Agri. & Food Chem.* 3: 319-321, April 1955.
- (2) Kilpatrick, J. W., and Schoof, H. F.: DDVP as a toxicant in poison baits for housefly control. *J. Econ. Entomol.* In press.

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## Epidemiologists' Conference Organized

The Conference of State and Territorial Epidemiologists was organized in Atlanta at the close of the second national meeting of epidemiologists, May 16-18, 1955. The conference was sponsored jointly by the Communicable Disease Center and the National Office of Vital Statistics of the Public Health Service.

Since the first meeting of State epidemiologists in 1951, called by the Public Health Service at the request of the Association of State and Territorial Health Officers, epidemiologists have been active in recommending improvements in the various communicable disease control programs and in Federal and State morbidity reporting systems. Through the conference a broader avenue of approach will be open to them.

The officers for the newly organized conference are: president, Dr. Roy F. Feemster, Massachusetts; president-elect, Dr. A. C. Hollister, Jr., California; vice president, Dr. A. L. Gray, Mississippi; secretary-treasurer, Dr. Samuel B. Osgood, Oregon. Chosen as members of the council were: Dr. Ruth Church, Illinois; Dr. L. L. Parks, Florida; and Dr. Robert F. Korns, New York.

# Our Growing Demands for Water

—What To Do About Them—

By CARL G. PAULSEN, B.S.C.E.

THE BLEAK RUINS of the cliff dwellings in the southwest and the associated remnants of irrigation ditches built by a people long forgotten suggest that a former civilization of our country was a mortal victim of a shortage of water. Water is also the key resource of our present civilization, and, as population increases and industry expands, we are confronted more and more frequently by the question of what to do about our growing demands for water. Fortunately, we of the present day have the knowledge and mechanical facilities to deal with problems of water supply in ways infinitely better and more effective than those antecedent tenants of our country.

Taken as a whole, the earth has a marvelously efficient water supply system. In a sense the sun acts as a huge pump circulating water in a closed circuit, the hydrologic cycle. As water comes within our reach, we use it as we need

it, and after its temporary service, it continues its natural course in the cycle. Notwithstanding the remarkable efficiency of this system, a serious problem of utilization is presented by its lack of uniformity. The quantity and quality of our water supply are variable in time and place. The present extended drought in the south and southwestern States and many of the numerous public water supply shortages experienced throughout the United States during the last few years are evidence of this variability.

The shortages are also aggravated by our ever-increasing requirements for water. Our withdrawal use of water increased fourfold between 1900 and 1950, and it has been estimated that it will double between 1950 and 1975. Modern domestic conveniences have greatly increased our water requirements. Air conditioning, automatic home laundries, and automatic dishwashers were unheard of 50 years ago and were not common even 25 years ago. Many household appliances that are not ordinarily thought of as heavy users of water have greatly increased the electric power consumption, and that, in turn, has increased the water use at the central hydroelectric or steam powerplants.

Advances in technology have added greatly to industrial water requirements, both in quantity and quality. Synthetic fibers, such as rayon and nylon, require much larger quantities of water for processing than the natural materials they replace. Synthetic rubber produc-

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*Mr. Paulsen, chief, Water Resources Division, Geological Survey, Department of Interior, has served continuously in the Survey since 1913, as a hydraulic engineer on water investigations. He is the author and co-author of many technical papers and articles on water and of many water supply papers of the Geological Survey. Mr. Paulsen's paper was presented at the annual meeting of the American Association for the Advancement of Science, December 27, 1954, at Berkeley, Calif.*

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tion requires large quantities of water not needed in production of natural rubber. Each additional stage in oil refining requires additional process water, increasing the quantity required per unit of crude oil considerably above that needed by earlier simple stills.

### Large Supply—Unevenly Available

Much has been said and written concerning the nationwide water situation. If we use long-term average runoff as an index, we can estimate our annual available water supply at about 1,300 million acre-feet, as compared with a withdrawal use at present of about 195 million acre-feet. Even regionally the situation is not serious, but in certain local areas it is critical. The total average annual supply in the 17 western States is about 390 million acre-feet, as compared with the present withdrawal use of about 100 million acre-feet. Except for irrigation, only a small part of the water withdrawn for use is consumed; some estimate the amount to be as little as 10 percent. Therefore, the ratio as a whole between supply and demand appears even more favorable if consumptive use, rather than withdrawals, is taken into account.

We can see that nationwide this country is blessed with a plentiful supply of water. However, some areas have a surplus of water all of the time, whereas other areas may have a surplus during some seasons, and still other areas seldom have sufficient water. Differences in water supply are striking. Using the runoff as an index of available supply, the greatest supply at any place in the United States is along the coast of the Pacific northwest, particularly in the Olympic Mountains, where the average annual runoff of Wynoochee River at Oxbow, Wash., would cover its drainage to a depth of about 150 inches. On the other hand, several areas in the southwest have an average annual runoff of less than one-fourth inch, and no streams flow out of the Great Basin.

The variation in daily streamflow may be very great. In some arid or semiarid regions 90 percent of the annual runoff may occur in a single week. On the other hand, some streams have an exceptionally uniform rate of flow. The Loup River and its tributaries draining the

Sand Hill region of Nebraska are noted for their uniform flow. The average flow on about 75 percent of the days is within 10 percent of the average annual flow. The Deschutes River, a spring-fed stream in Oregon, is another example of uniformity of flow.

The annual runoff of most streams, however, is highly variable. A stream in which the variability is especially high is the San Gabriel River in California in which, during the 56-year period 1896 to 1951, the annual runoff averaged 116,000 acre-feet but ranged from 10,000 acre-feet in 1899, or less than 9 percent of the average in 1922, to 410,000 acre-feet or 353 percent of the average.

The ready availability of the large quantities of good water required by our modern communities was not a consideration in their original establishment, and, as those communities grow, the problems of water become more and more difficult and costly of solution. Los Angeles is an extreme example of this kind of situation. There, 3 percent of the Nation's population lives in an area that receives only 0.04 percent of the Nation's precipitation and has less than 0.0005 percent of the Nation's streamflow. Consequently, it has been necessary to import large quantities of water great distances at great expense.

This is the broad picture then, the base from which we must proceed: In terms of the entire country, we have a generous supply of fresh water, but it is so unevenly distributed that the supply is more than ample to meet our present requirements in some places and insufficient in others. Our water supply, very large though it may be, is variable in time, place, and quality. We must recognize, therefore, that in many areas there will never be as much water as can be used. Consequently, our concern is to take stock of these variables so that we may undertake such steps as seem feasible to derive more benefit and service from our water resources.

Several possible steps are suggested: It may be possible to develop new sources of supply, as by inducing artificial precipitation and demineralizing saline waters. The present supplies may be developed further by storage, control of pollution, and so forth. Water losses may be

reduced. Existing supplies may be utilized further through more efficient use and by re-use.

### Developing New Sources of Supply

The possibility of increasing precipitation by cloud seeding is being explored by several groups, but definite conclusions as to the success of cloud seeding in stabilizing or increasing to a substantial extent water supplies in areas of short supply seem not yet conclusively demonstrated.

The prospect of increasing our fresh water supply by converting saline water to fresh water appears to be promising under certain conditions.

Congress, in 1952, passed Public Law 448, providing for research which may lead to development of practical processes for converting saline water to fresh water. The Saline Water Conversion Program is conducted by the Department of the Interior by coordinating and encouraging research in this field through federally financed grants and contracts.

It is possible that converted saline water can be used economically by some municipalities, especially those in water-short areas of high productive value, if fresh water can be provided at the cost of about \$125 an acre-foot, and for irrigation in highly productive areas if fresh water can be supplied at a cost of \$40 an acre-foot or less.

One of the processes being investigated—the ion-permeable membrane process—might prove to be an answer to some water needs since its cost is proportional to the dissolved solids content of the raw water. Typical preliminary cost estimates of conversion of fresh water are about \$450 an acre-foot for sea water, \$40 an acre-foot for saline water from Texas containing about 10,000 p.p.m. of dissolved solids, and \$4 an acre-foot for water from South Dakota with a dissolved solids content of about 855 p.p.m.

The present fresh water supplies can, of course, be developed further and in many places quite extensively by the use of additional storage reservoirs and by improving the quality of the water. As our water resources become more highly developed, water quality becomes increasingly important. Poor quality is detri-

mental to the utility of a supply because it makes the water unsuitable for some use and for certain other uses, such as irrigation, it necessitates the application of larger quantities to prevent an undesirable accumulation of minerals in the soil.

Storage facilities, both surface and underground, enable us to extract more service from our water supply. During the last 7 years the surface reservoir capacities for the Nation have been increasing at an annual rate of more than 16 million acre-feet. In January 1954 there were 1,300 reservoirs in the United States having a usable capacity of more than 5,000 acre-feet. Their combined usable capacity was 278 million acre-feet.

In the 17 western States, the total usable reservoir capacity amounted to 193 million acre-feet of which more than 59 million acre-feet is provided for irrigation. Many additional reservoirs of less than 5,000 acre-feet capacity are used for irrigation. According to the Bureau of the Census, about 5,500 reservoirs having a capacity of less than 1,000 acre-feet were used for irrigation in the 17 western States in 1950.

Although the water stored at any one time in all the rivers and lakes of the Nation is enormous, the volume of fresh water stored in the countless natural openings in the soil and rocks beneath the water table is probably several times greater. The volume of water stored beneath the land surface is dependent primarily upon the physical characteristics of the rocks and the climate. Nevertheless, the continued usefulness of a ground water reservoir ultimately must depend, not on its extent and the quantity of water originally contained but on the conditions affecting both replenishment and transmittal of the water from recharge areas to the point of use.

Surface and subsurface reservoirs have several characteristics in common. Sufficient water must be available to replenish them. Both are refilled during wet periods, so, in order to be of maximum use, water should be withdrawn during dry periods to make room for a new supply. A reservoir which is full all of the time is not serving its primary function. This is a characteristic of subsurface reservoirs that may be overlooked since they are not visible.

tion requires large quantities of water not needed in production of natural rubber. Each additional stage in oil refining requires additional process water, increasing the quantity required per unit of crude oil considerably above that needed by earlier simple stills.

### **Large Supply—Unevenly Available**

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Several possible steps are suggested: It may be possible to develop new sources of supply, as by inducing artificial precipitation and demineralizing saline waters. The present supplies may be developed further by storage, control of pollution, and so forth. Water losses may be

roughly estimated to be about 15 million acre-feet per year. This does not include evaporation from water surfaces of natural streams. Although the evaporation process is unavoidable, the total loss by this cause can be held to a minimum by careful locations of reservoirs and by establishing suitable operating procedures. Climatic factors affecting evaporation often vary widely within a drainage basin. If alternate reservoir sites are available, evaporation losses can be held at a minimum when the site selected is one which has the smallest surface area and climatic conditions that are least favorable for evaporation. Water losses from a system of reservoirs can be reduced by using water from those reservoirs having a high evaporation potential first so that their surface area is appreciably reduced.

The Geological Survey of the Department of Interior in collaboration with several other Federal agencies has completed a research project to test several methods of measuring evaporation reliably from large bodies of water. The results of these tests are now being applied to Lake Mead, Nev.

The Geological Survey is also making a study of the evaporation from Lake Colorado City in Texas. This lake is used as a cooling pond for a large steam powerplant. The object of the study is to determine evaporation from the lake, including the effect of added heat, and to determine the effect of added heat on the thermal structure of the lake. The results of this study will enable us to estimate the extent that ponds may be used for cooling and enable us to decide whether the use of cooling ponds is good conservation practice.

Bodies of ground water, like surface reservoirs, may be subject to large losses. One source of large losses is transpiration by phreatophytes, or water-loving plants, such as salt cedar which have little or no economic value. It has been estimated that salt cedar may transpire as much as 7 acre-feet of water per acre annually. A Geological Survey engineer has estimated that phreatophytes of all kinds now cover about 15 million acres in the 17 western States and may consume in the aggregate as much as 20 to 25 million acre-feet annually, a volume of water equal to about twice the average

annual flow of the Colorado River at Lees Ferry, Ariz.

A second source of substantial loss from ground water is evaporation from areas where the water table is only a few feet below the land surface and its overlying capillary fringe extends up to the land surface. Evaporation from such areas is continuous, being sustained by water which rises through the capillary fringe, just as a flame is sustained by capillary rise of fuel in the wick of a kerosene lamp. Evaporation losses from such areas are large. In the Big Smoky Valley of Nevada, evapotranspiration losses may be considerably in excess of 100,000 acre-feet a year.

Large losses from shallow ground water bodies by evapotranspiration have an adverse effect on the quality of the remaining water. Plants use only a very small part of the dissolved solid content of the water, and none of the minerals are carried away by the evaporated water. As a result, these dissolved solids become concentrated in the water that remains or are precipitated in the soil, to be redissolved by subsequent rains. Therefore, the reduction of losses in these various ways would not only increase the quantity of water available but would also improve its quality.

### Re-use of Waste Water

Use of waste or polluted water, wherever quality requirements will permit, is another way of increasing the effective water supply. The practice of using sewage effluent for irrigation is not new; it has been known for almost 100 years. Treated sewage effluents have been used also as a source of water for industry and for ground water recharge. As an indication of this trend, the Shell Oil Company recently made arrangement to reclaim waste water from the Ventura, Calif., sewage disposal plant at the rate of 2 million gallons a day. Some sewage is not suitable for re-use, especially if the raw water contains a high concentration of dissolved solids, or if the sewage contains undesirable industrial wastes. In general, the domestic use of water will increase the dissolved-solids concentration by an average of 100 to 130 p.p.m.

The University of California Engineering

Department recently estimated that in California there is approximately 1 million acre-feet of waste water available for re-use. The Geological Survey estimated that about 4 million acre-feet of water was used for industrial and domestic use from public supplies in the 17 western States during 1950.

Industry frequently uses its waste water by recirculation. Re-use of water in industry does not reduce the consumptive use of water but greatly reduces the withdrawal use. The water requirements within an industry range widely, indicating a wide range in economy of water use.

Many examples can be cited where re-use of water has tremendously reduced the water intake. Probably the most frequently cited example is the Fontana Plant of the Kaiser Steel Company where the intake per ton of steel is only 1,100 gallons as compared with the industrywide value of 65,000. A steam electric powerplant recently constructed in Texas uses only 1 gallon of water per kilowatt hour output, as compared with 60 to 100 gallons for steam powerplants where the cooling water is not circulated.

The Water Resources Division of the Geological Survey recently made a survey of the water requirements of the pulp and paper industry. On the average, the maximum rate of water use per ton of paper produced was about 5 times the minimum rate in making similar products in the same general area. A similar survey of the water requirements of the carbon black industry shows an even wider range in water use. Process water required to produce a pound of carbon black ranged from 0.79 gallon to 20 gallons by the furnace process and from zero to 0.19 gallon by the contact process.

Much of the industrial water is used for cooling and, therefore, cooling towers and ponds become important where water is re-used. Each recycling of the water through a cooling tower reclaims about 95 percent of the water. The only loss from the system is that small quantity evaporated to accomplish the cooling and a small amount of blowdown to maintain reasonable concentrations of dissolved solids in the recirculated water. The loss from a cooling pond is the evaporation owing to the addition of warmed water plus natural evaporation and

seepage. The present rate of installation of cooling towers indicates increased re-use of water. In 1953, the member companies of the Cooling Tower Institute sold 38 installations to private and public steam-electric generating plants having a combined capacity of 1 million gallons a minute.

Many of the industry's water requirements, particularly that for cooling, can be adequately fulfilled by salt water where it is available. To safely use saline water, industrial equipment must be fabricated of material to resist the chemical aggressiveness of the water. The quantity of saline water used is imperfectly known, but we do know that at least 14 million acre-feet is used annually and that the total quantity is probably much larger. If industry could afford to pay the higher installation and maintenance costs, a great deal more saline water could be used.

### Stretching the Available Supply

Although over much of the Nation there is plenty of water, the supply is extremely variable, and many communities will at times not have enough to satisfy their growing needs. A major problem then is to derive the maximum benefit and utility from our water resources.

Several courses of action are open by which we can stretch the available supply to satisfy the optimum use:

We can develop our present supplies more intensively by construction of additional reservoirs, development of presently unused ground water reservoirs, and more extensive use of artificial recharge of ground water reservoirs.

We can increase the usable supply by reducing or preventing contamination from saline waters, urban wastes, or industrial wastes, along the lines encouraged by the Public Health Service under the Water Pollution Control Act. Many acre-feet of water are lost annually by unproductive evaporation and transpiration. Reduction of these losses will in effect increase the quantity and improve the quality of our usable water supply. Our water supply will go further if we closely match water quality and water requirements, that is, if we use high qual-

ity water for uses that require high quality water and use water of poorer quality where it can be tolerated. Thus, we may be able to use some sewage effluents and saline waters which are presently wasted. A large quantity of waste water can be salvaged by re-using or recirculating water in our industrial plants. An acre-foot of water salvaged and re-used is just as effective as an acre-foot of newly developed water. Possibly some additional water can be provided by conversion of saline water to fresh water.

In many parts of the Nation many of the inexpensive sources of water have already been developed. As our water resources become more and more intensively developed, the cost of new developments will continue to increase. At the present time, most of the conservation measures that are mentioned are technically feasible. In some places they are economically feasible. The economic feasibility of these

measures will become widespread as competition for water increases.

The solution of our problem requires facts—facts on a local scale involving all the variables of streamflow, storage, and movement of ground water, and the mineral and sediment concentration and temperature characteristics of the water. We have made considerable progress in collecting, compiling, and interpreting data on water resources, but we need to know more, especially more details on the local scale. We need to know more about evaporation and transpiration losses, their magnitude and methods of reducing them. We need to know more about reclaiming waste water and about the water requirements of industry both as to quantity and quality.

Detailed knowledge of our water resources and of their uses is a prime essential to assure the most benefit and utility from our water resources.

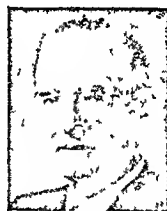
## Departmental Announcements

**Oveta Culp Hobby**, Secretary of Health, Education, and Welfare, resigned from her position effective August 1, 1953. Mrs. Hobby was appointed Federal Security Administrator on January 21, 1953, and was made Secretary on April 11, 1953, when the Federal Security Agency became the Department of Health, Education, and Welfare. She resigned the positions of editor and publisher of *The Houston Post* and executive director of Station KPRC-AM-FM-TV, Houston, Tex., at the time of her appointment.



Mrs. Hobby came to her Cabinet post with a distinguished record of public service. She directed the Women's Army Auxiliary Corps in 1942. In 1943 she was appointed director of the Women's Army Corps with the rank of colonel. She was awarded the Distinguished Service Medal by the United States Government and the Military Merit Medal by the Philippine Government. The author of a textbook on parliamentary law, Mrs. Hobby served for several years as parliamentarian in the Texas House of Representatives. She also served on the board of directors of the American Society of Newspaper Editors.

**Marion B. Folsom**, Under Secretary of the Treasury since January 1953, has been named by President Eisenhower to succeed Secretary Hobby. Active in Government and private industry social security programs for more than a quarter of a century, Mr. Folsom was a member of President



Roosevelt's advisory council which helped draft the original Social Security Act in 1934. In subsequent years, he served on advisory councils which studied operations of the social security system and made recommendations to the Congress. He worked with the Department of Health, Education, and Welfare on the plans which in 1954 resulted in congressional amendments to extend social security coverage and benefits. He also was chairman and a founder of the Committee of Economic Development.

Mr. Folsom was instrumental in the development of the group life insurance program for Federal employees which was put into effect in August 1954. Several years earlier he had helped organize the Group Medical Care Insurance Plan in Rochester, N. Y.

A graduate of the University of Georgia and the Harvard Business School, Mr. Folsom was treasurer and a director of the Eastman Kodak Company from 1914 until January 1953, before he came to the Department of the Treasury.

# Technical Report on Poliomyelitis Vaccine

ON June 10, 1955, the Public Health Service sent a Technical Report on the Salk Poliomyelitis Vaccine to the Secretary of Health, Education, and Welfare. Published below are the summary, the report on epidemiological experience and new developments in biologics, and an expanded calendar of events. Copies of the report were made available to all State and local health departments. Since only a limited number of copies are available through the Public Health Service, it is recommended that interested health department employees obtain a copy in their own agency.

## Summary

The report presents the technical problems involved in the production, testing, and safety of Salk poliomyelitis vaccine. It also describes the responsibilities of the Public Health Service in control of the manufacture of the vaccine as a biological product.

The vaccine as prepared for the 1954 field trial was an experimental product made by commercial producers for the National Foundation for Infantile Paralysis. After some initial difficulty, the industrial firms were able to turn out a good product, and the field trial was carried out successfully. Vaccine production for the field trial permitted the laboratories of industry and the Public Health Service to acquire experience in testing.

As a result of its studies over a period of 2 years, which included participation with industry and with Dr. Jonas Salk in testing of vaccine for the field trial, the Public Health Service planned to act quickly on licensing if the analysis of the field trial data showed that the vaccine was safe and effective. It had issued prospective minimum requirements in May 1954, as advisory for pharmaceutical labora-

tories which might wish to manufacture and store vaccine intended for commercial use pending decision to license the product. When the success of the field trial was reported April 12, 1955, official minimum requirements were issued. Six manufacturers, each of which had produced vaccine under the provisional requirements, were granted licenses.

Records and samples of vaccine lots had been submitted to the Public Health Service Laboratory of Biologics Control prior to April 12, and, within the next few days, those which were considered acceptable were released. Most biological products for commercial distribution are released on the basis of an examination of the detailed record of events in manufacture and testing (known as a protocol), with or without further testing by the Laboratory of Biologics Control. Release of most of the lots of poliomyelitis vaccine was based on review of the manufacturing protocols. Tissue culture tests for the presence of live virus were completed prior to release by the Laboratory of Biologics Control on about half of these lots and monkey tests were completed on 6 lots involving at least 1 lot from each of 5 manufacturers.

On April 26, six cases of poliomyelitis were reported among children who had received vaccine manufactured by the Cutter Laboratories. At the request of the Public Health Service, this firm immediately recalled all of its vaccine. The ensuing investigation of the Cutter Laboratories was later extended to the entire industry and led to a temporary suspension of the nationwide vaccination program.

The Public Health Service on April 28 established a Poliomyelitis Surveillance Unit within its Communicable Disease Center in Atlanta, Ga. This unit is investigating all reported cases of poliomyelitis, whether or not asso-



ciated with vaccine. Sixteen virus laboratories, throughout the Nation, are cooperating in examining and reporting upon specimens collected from cases and suspected cases. The epidemiological data so far obtained clearly define the Cutter incident as an outbreak with characteristics of a common source epidemic. The cases of poliomyelitis following use of vaccines made by the other manufacturers have not been more numerous than would be expected at this season except for a few cases which suggested (but were too few to be conclusive) an association with one lot of vaccine produced by Wyeth Laboratories. That firm has withdrawn the unused portion of this lot.

The Salk vaccine is a suspension of poliomyelitis virus inactivated by formaldehyde to make the virus harmless but still capable of inducing the production of antibodies. The vaccine contains inactivated virus of each of the three types. The original concept of vaccine preparation was that the process itself assured a wide margin of safety. Safety tests for the vaccine were conceived to detect both mass contamination resulting from accidents in manufacture and residual live virus which the process was intended to eliminate.

The intensive investigations of the past 5 weeks indicate that the records manufacturers were required to submit did not include certain data which are essential for an adequate assessment of consistency in performance. The protocols submitted related only to lots of vaccine proposed for clearance and gave no information concerning lots discarded in the course of manufacture. Further, the information requested did not bring out certain data on processing and testing now known to be important.

The total experience of the manufacturers now reveals that the process of inactivation did not always follow the predicted course, since positive tissue culture tests not infrequently occurred after the expected completion of the inactivation process. Greater dependence, therefore, must be placed on sensitive tests for very small quantities of residual live virus as part of process control.

Two types of tests are used to determine the presence or absence of live virus in the vaccine: the monkey test and the tissue culture test. The tissue culture test has been found to be more

sensitive than the monkey test. It must be performed with a large enough sample of vaccine and under closely controlled conditions if it is to have the maximum value. The theoretical considerations which govern inactivation and testing have been analyzed in the light of information developed during this inquiry.

As a result of the inquiry and of analysis of the manufacturers' experience and records, changes were made in processing control and safety testing. Revised requirements in the testing procedures were established, and the release of vaccine was resumed. The modifications provide greater assurance of safety. As a result of the review and the institution of revised requirements, the production and availability of vaccine has been delayed.

The Salk vaccine applies new practices in the production of viral vaccines. The vaccine has progressed from the experimental level to large-scale production with unprecedented rapidity. This speed, reflecting the increased tempo of all medical research, created problems in biologics control amenable to solution only with the accumulation of knowledge and experience. It is likely that other problems of equal complexity will be raised by the development of other new viral vaccines. Action taken by the Public Health Service for dealing with both the current and the long-range problems include:

1. Amendment of minimum requirements for the production and testing of poliomyelitis vaccine.
2. Incorporation of minimum requirements in official regulations as mandatory standards.
3. Creation of a Technical Committee on Poliomyelitis Vaccine.
4. Creation of a Division of Biologics Standards, with strengthened staff and facilities.
5. Increased onsite plant surveillance and consultation.
6. Reoriented testing and research program.
7. Establishment of a Poliomyelitis Surveillance Unit.
8. Review of legislative authority.

### Epidemiological Experience

Investigation of reports of paralytic poliomyelitis occurring in association with injections of vaccine was assigned to the Communicable



Disease Center. The newly established Poliomyelitis Surveillance Unit has operated to yield precise field information on the occurrence of poliomyelitis throughout the country. As a result of this activity the Cutter incident was clearly defined as an outbreak with characteristics of a common source epidemic.

### *Poliomyelitis Surveillance Program*

The Public Health Service conducts a surveillance program through its Communicable Disease Center to help the States in rapid recognition, study, and control of such diseases as malaria, typhus, smallpox, diphtheria, psittacosis, and rabies. In 1954, CDC personnel collaborated in the poliomyelitis field trial evaluation, under the direction of Dr. Thomas Francis.

The Public Health Service had prepared, with State health departments and cooperating lab-

oratories, to extend surveillance over poliomyelitis this season. This surveillance was highly desirable to study the durability of immunity in the half a million children who had been immunized during the field trials in 1954, and even more desirable if the results of the field trial led to a general immunization program in 1955.

When the first occurrence of poliomyelitis cases in vaccinated children was reported, this program was quickly brought into play to collect and evaluate field and laboratory data which might indicate the nature and significance of the disease outbreak. Although some cases of poliomyelitis could be expected to occur by coincidence following vaccination, each reported case deserved thorough investigation.

On April 25, 1955, the Public Health Service received a report of poliomyelitis in a Chicago

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## Poliomyelitis Vaccine Distribution

Plans for the voluntary control and distribution of poliomyelitis vaccine this autumn rest at present on two conditions:

1. The completion of the program of the National Foundation for Infantile Paralysis to provide vaccine for first and second grade school children. When this occurs, an agreed-upon system of voluntary controls will go into effect. Vaccine will be shipped into each State by the manufacturers under a plan that will assure equitable distribution among the States, and which will take into account the desires of States as between public vaccination programs and distribution in normal drug channels.

2. The assumption that the vaccine will still be in short supply. If this condition prevails, it will demand strenuous efforts to assure that available supplies are distributed equitably among the States and among children in the priority age group in all parts of the States.

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*Statement by Otis L. Anderson, Assistant Surgeon General, and chief, Bureau of State Services.*

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The Public Health Service responsibilities for allocating vaccine equitably among the States are described in this chart.

For instance, under Step 1, the National Advisory Committee on Poliomyelitis Vaccine recommended that vaccine initially be given to children of 5 through 9. As increased supplies of vaccine become available, additional age groups will be included. In Step 2, a State's share of this child population will determine its share of vaccine. Thus, if a State has 2 percent of the Nation's population of children in the priority group, it will be entitled to 2 percent of the available supply of vaccine.

The other steps describe the procedures developed to assure a proper division of vaccine, as determined by each State authority between public agencies and private distribution outlets. Public agencies include local health departments, State clinics, public hospitals, and any other facilities whose services are provided through tax funds; private channels of distribution include drug stores, physicians, and pri-

vately operated hospitals, etc. The proportion of immunizations provided by public agencies in each State will vary, depending on how much vaccine the State decides to purchase, plus the amount, if any, purchased by other funds.

Once the Public Health Service has advised the State of the amount of vaccine available to it, and has advised the manufacturers of the State's allocations to public agencies (Steps 3 through 7), the task of assuring fair distribution within the State will be borne by the State authority.

The key to intrastate distribution is the quality of planning in the State itself. Through regional meetings and individual consultation the Public Health Service has worked with all States and Territories in devising the basic elements of intrastate plans. Obviously, no single plan can be devised that would fit the needs and resources of all States. The Executive Committee of the State and Territorial Health Officers' Association collaborated with the Public Health Service in the development of suggested princi-

child who became paralyzed approximately one week after injection of vaccine manufactured by the Cutter Laboratories.

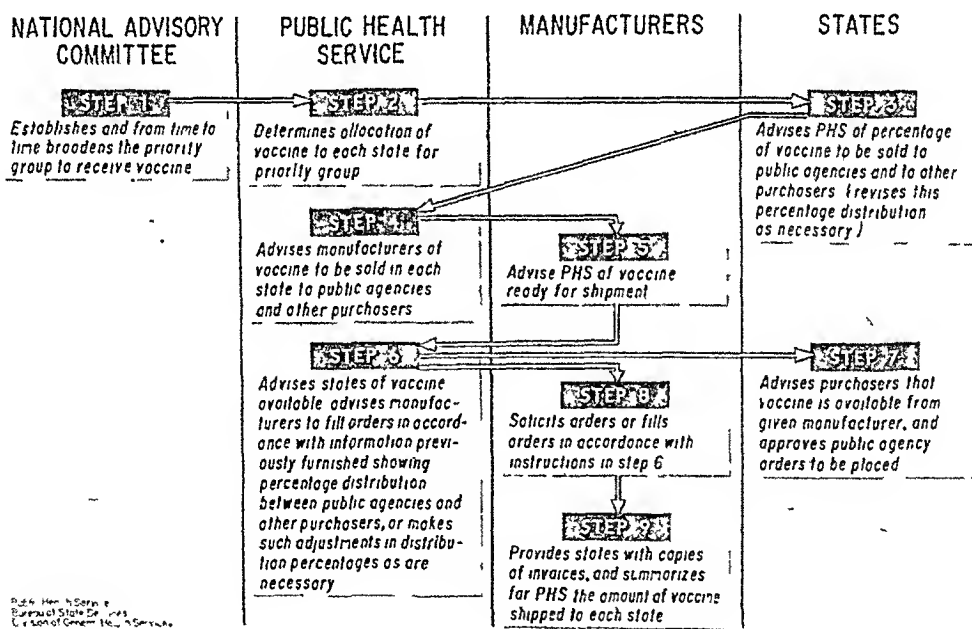
On April 26, at noon, illness suspected to be poliomyelitis was reported from the Napa Valley, Calif., in a child who also had received Cutter vaccine about one week previously. On the evening of April 26, four other cases of illness following injection of Cutter vaccine were reported from widely separated areas in California. California State health authorities immediately started investigation of the cases.

The absence of other known poliomyelitis in some of these areas at the time, the interval between vaccination and onset of the disease, and correlation between site of injection and site of paralysis created sufficient presumptive evidence of association with the vaccine to cause the Public Health Service to take action.

On April 27, the Surgeon General requested the Cutter Laboratories to recall all of its product pending a complete investigation. On April 28 he directed that the surveillance program be expanded to aid in evaluation, by epidemiological observations, of the occurrence of poliomyelitis in relation to vaccination. The data presented here are derived from reports of the Poliomyelitis Surveillance Unit through May 27, 1955, and constitute the field data which the Public Health Service has considered in determining actions since April 26.

### *Poliomyelitis Associated With Vaccination*

A total of 113 poliomyelitis cases, with 5 deaths, were recognized among nearly 5½ million individuals within one month after injection of poliomyelitis vaccine (table 1). The greatest number of cases associated with the



ples of intrastate distribution. Included in this material are the following suggested objectives:

1. Equitable distribution of vaccine to eligible persons—the priority age group—in all areas throughout the State.

2. Public acceptance of the vaccine and the distribution plan.

3. Acceptance of and adherence to program principles by physicians, local health officers, pharmacists, and other related professional groups. (Accurate records and either a plan for screening orders in advance or a "post-audit" system will be necessary to assure equitable distribution, and to prevent the piling up of

stocks in some areas and consequent deprivation in others.)

The manufacturers have cooperated fully in setting up their part of the voluntary control system. The public health profession has the job of planning its corollary organization and of making the whole system function.

**Table 1. Poliomyelitis cases and attack rates in recipients of poliomyelitis vaccine, with onsets between Apr. 20 and May 21, 1955**

Vaccine manufacturer	Approximate number of vaccinees (total)	Cases			Total attack rates per 100,000 per month <sup>1</sup>
		Paralytic	Non-paralytic	Total	
Total-----	5,394,000	78	35	113	2
Cutter-----	409,000	59	10	69	17
Lilly-----	2,514,000	10	19	29	1
Parke Davis-----	1,234,000	2	0	2	<1
Pitman-Moore-----	461,000	0	2	2	<1
Wyeth-----	776,000	7	1	11	1

<sup>1</sup> These attack rates are of limited significance in themselves, since vaccinees of some manufacturers were used in areas in which the seasonal rise in incidence already had begun.

product of any one manufacturer was 69—59 of them paralytic. These cases occurred among approximately 409,000 recipients of vaccine prepared by the Cutter Laboratories. The attack rate in this group was 17 per 100,000 in 1 month.

Most of these cases were reported from California and Idaho where the National Foundation for Infantile Paralysis provided Cutter vaccine for school clinics, but a scattering of cases occurred in other parts of the country where the vaccine had been released in small quantities through commercial channels. Cutter vaccine was used for school clinics in Arizona and New Mexico; but no cases have been reported among vaccinated children from these States.

Among approximately 4,985,000 persons who received the products of four other manufacturers, a total of 44 cases was reported, only 19 of which were paralytic. The attack rate in this group was less than 1 per 100,000 in 1 month. The nonparalytic cases are of epidemiological significance but of little clinical or social importance. The reporting of nonparalytic poliomyelitis depends upon diagnostic practices, which vary from place to place; 12 of the 25 nonparalytic cases were reported from Texas. Since, however, official weekly morbidity reports from States do not always distinguish between paralytic and nonparalytic cases, the latter are included in this analysis in

order to compute "expected" cases by comparison with 5-year trends based on State reports.

Cases associated with vaccine produced by other manufacturers include: 19 paralytic and 10 nonparalytic Lilly-associated cases, largely from southern States; 7 paralytic and 4 nonparalytic Wyeth-associated cases from the mid-west and east; 2 paralytic Parke Davis-associated cases from Illinois; and 2 nonparalytic Pitman-Moore-associated cases from Nebraska.

Type 1 poliomyelitis virus has been isolated from 17 Cutter-associated and 2 Wyeth-associated cases. One isolation of type 2 and one isolation of type 3 virus have been made from two separate Lilly-associated cases.

### *Cases Reported and Number Expected*

It was only among first and second grade children who received vaccine that age is known with sufficient accuracy to calculate expected numbers of cases. It is not possible to compare the vaccinated group with a nonvaccinated group in the same areas because a very high proportion of the children of this age received vaccine. The method used in computing ex-

**Table 2. Comparison of reported and expected numbers of poliomyelitis cases in children receiving poliomyelitis vaccine in National Foundation for Infantile Paralysis clinics, Apr. 15—May 7, 1955**

Vaccine manufacturer	Approximate number of vaccinees (NFIP clinics only)	Poliomyelitis cases, with onset from Apr. 20—May 21	
		Reported number <sup>1</sup>	Expected number <sup>2</sup>
Total-----	4,844,000	79	36
Cutter-----	309,000	35	5
Lilly-----	2,514,000	29	24
Parke Davis-----	834,000	2	3
Pitman-Moore-----	411,000	2	2
Wyeth-----	776,000	11	2

<sup>1</sup> Reported cases aged 6—8 years with onset between Apr. 20 and May 21. Includes both paralytic and nonparalytic cases since expected numbers for comparison are based on crude rates which include all cases reported as poliomyelitis in previous years.

<sup>2</sup> Expected cases if the estimated, age-adjusted, median attack rate for the previous 5 years had pertained in the vaccinees of 1955.

NOTE: These rates are specific for geographic areas where the various poliomyelitis vaccinees were used.

pected cases has been to apply the median attack rate for the past 5 years in each geographic area to the number of children who were vaccinated. This is a crude measure, since poliomyelitis incidence undergoes wide and unpredictable variation in successive years, but it provides the best available tool to determine whether cases among children vaccinated are more common than would be expected by coincidence (table 2).

The difference between the numbers observed and expected (35 and 5) is significant in the case of those receiving Cutter vaccine and demonstrates an association between the Cutter product and an increased poliomyelitis incidence. The excess of reported cases over the expected number vaccinated with the Wyeth product (11 and 2) may be significant, but the numbers are too small to permit firm interpretation of such crude data.

Among the children who received vaccines made by Lilly, Parke Davis, and Pitman-Moore, the numbers of cases reported are within the range expected by chance occurrence.

#### *Evidence of Infectious Virus in Vaccine*

Evidence supports the hypothesis that the excess cases among individuals receiving Cutter vaccine may have resulted from the use of vaccine containing infectious virus. This evidence falls into three categories:

1. The interval between injection of vaccine and first paralysis in Cutter-associated cases ranged from 5 to 20 days (table 3). The median case occurred on the ninth day and the spread of the mid three-quarters was from 6 to 14 days. This finding parallels the frequency distribution of incubation periods in monkeys infected by intramuscular injection of virus. Moreover, the temporal distribution of cases following injection of Cutter vaccine is the expected distribution in a common source outbreak resulting from a single exposure to the infectious agent.

Additional significance attaches to these findings when comparison of the intervals between inoculation and first paralysis is made specific for geographic area and calendar time. Large numbers of children received Cutter vaccine in clinics in California and Idaho, the California clinics being held slightly before those in Idaho.

**Table 3. Paralytic poliomyelitis cases by interval between poliomyelitis vaccine inoculation and onset of paralysis, Apr. 20-May 21, 1955**

Interval (days)	Paralytic poliomyelitis cases in vaccinees inoculated with material produced by—				Experimental data on monkeys <sup>1</sup>
	Cutter	Lilly	Parke Davis	Wyeth	
Total <sup>2</sup>	50	9	1	6	32
5-7	8	2	0	0	3
8-10	22	4	0	1	12
11-13	8	0	0	1	9
14-16	9	1	1	0	3
17-19	2	1	0	1	3
20-22	1	1	0	1	1
23-25	0	0	0	2	1

<sup>1</sup> Data abstracted from David Bodian: Viremia in experimental poliomyelitis. *Am. J. Hyg.* 60:358, November 1954. Mahoney virus was injected into the right calf of 32 cynomolgus macaques and the interval between inoculation and paralysis recorded.

<sup>2</sup> Data not available on interval for 9 Cutter cases and 1 each of Lilly, Parke Davis, and Wyeth.

Yet, the distributions of cases following vaccination in these two areas show marked similarity when adjusted for time differences.

2. Cutter-associated cases show a high degree of correlation between the extremity injected with vaccine and the extremity which was first paralyzed; 43 of 55 cases (78 percent) on whom records are complete showed this relationship (table 4). This finding is strikingly similar to the experimental experience in monkeys.

In contrast to this high degree of correlation for Cutter-associated cases, only 1 of 10 Lilly-associated cases showed this relationship.

Paralytic cases associated with Wyeth and Parke Davis vaccine, although consistent with this observation on correlation, are too few to warrant conclusion.

3. A number of poliomyelitis cases have occurred among household associates of vaccinated children (table 5). A total of 47 such cases (39 paralytic and 8 nonparalytic) had been recognized by May 27. These were distributed about equally between parents and children. Of the 47 cases among household associates, 35 (29 paralytic and 6 nonparalytic) were associated with Cutter-vaccinated children; 9 (7 paralytic and 2 nonparalytic) were associated with

**Table 4. Comparison of paralytic poliomyelitis cases in vaccinees by site of inoculation and site of first paralysis**

Sites of inoculation and first paralysis	Paralytic poliomyelitis cases in vaccinees inoculated with material produced by—						Experimental data on monkeys <sup>1</sup>	
	Cutter		Lilly		Parke Davis	Wyeth	Number	Percent
	Number	Percent	Number	Percent	Number	Number		
Total <sup>2</sup> .....	55	100	10	100	2	7	32	100
Same.....	43	78	1	10	1	3	23	72
Different.....	12	22	9	90	1	4	9	28

<sup>1</sup> Bodian, D. Unpublished data from experiment cited in table 3.<sup>2</sup> Data not available on site of first paralysis for 4 Cutter and 1 Lilly cases.

Wyeth-vaccinated children; and 3 (all paralytic) were associated with Lilly-vaccinated children. About one-third of the vaccinated children in these households had developed a minor illness within 2 weeks after inoculation and prior to the onset of poliomyelitis in the household contacts.

The interval between vaccination of children and the onset of poliomyelitis in their parents and siblings approximates two incubation periods in the 35 Cutter-associated and the 9 Wyeth-associated cases, as would be expected if the vaccinated child were the source of infection. The 3 Lilly-associated cases followed shorter intervals.

**Table 5. Poliomyelitis cases in household contacts of vaccinees with onset between Apr. 22 and May 27, 1955**

Cases in household contacts of vaccinees and onset interval	Vaccinees inoculated with material manufactured by—			
	Cutter	Lilly	Wyeth	Total
Total cases.....	35	3	9	47
Paralytic.....	29	3	7	39
Nonparalytic.....	6	0	2	8
Span in days between inoculation of vaccinee and onset in parent or sibling.....	19-33	8-14	17-30	8-33
Median days.....	19	9	19	19

<sup>1</sup> Excludes 1 case where interval was 2 days.

### *Evidence Against Provocation*

Another hypothesis considered in the investigation of cases of paralytic poliomyelitis in children following injection of vaccine was that central nervous system involvement may have been precipitated by the intramuscular injection of vaccine in individuals who were already infected with poliomyelitis virus. Had this been the case, the excess cases would be expected to occur in areas known to be experiencing some poliomyelitis. One might have expected naturally occurring cases at this season in the southern States and in southern California. The excess cases did not adhere to this pattern but occurred unexpectedly in Idaho in association with Cutter vaccine where no other poliomyelitis was being observed. They failed to occur in the southern States where a very large number of children received Lilly vaccine in areas where poliomyelitis was known to be present. These data do not support the provocation hypothesis.

### *Results of Epidemiological Survey*

A total of 113 poliomyelitis cases (78 paralytic and 35 nonparalytic) had developed by May 21 among more than 5 million individuals vaccinated against poliomyelitis since April 14, 1955. Comparison of reported and expected numbers of cases indicate association between Cutter poliomyelitis vaccine and an increased incidence of poliomyelitis. The distribution of Cutter-associated cases by interval between inoculation and date of paralysis and the correla-

tion between sites of inoculation and paralysis are strikingly similar to experimental data. These findings indicate that at least some of the Cutter-associated cases developed from use of poliomyelitis vaccine containing infective virus. Additional data relating cases to specific lots of vaccine are under analysis in connection with the study of the Cutter plant processes, and will be included in a report to be made when all phases of this study are completed.

Evidence is not conclusive but suggests there may have been a similar association with a few cases following the use of Wyeth vaccine. In contrast, the data indicate that the incidence of poliomyelitis after use of the products of other manufacturers was probably coincidental.

### New Developments

A number of aspects of the production and testing of the Salk poliomyelitis vaccine are unique. During the vaccine's development, field trial, and initial use, many problems arose, to which precedents and experience could not be applied. The progress of the vaccine to practical usability involved the National Foundation for Infantile Paralysis, local and State health officers, practicing physicians, university research laboratories, the pharmaceutical industry, and the Public Health Service. All these took part in arriving at major decisions, many of which established new precedents.

Progress in medical science is not always an uninterrupted forward motion. Throughout the history of medicine and public health, most great advances have been made step by step, with each new and unforeseen obstacle overcome, usually slowly, as it has been encountered. This has always involved a certain amount of acceptance of risk, trial and error, discovery of new knowledge, application of this knowledge in production and clinical use, and resumption of forward movement.

The development of the Salk vaccine is an example of this process in action at a very rapid rate. Events have been telescoped in time so that the vaccine has been developed, tested, and used in a matter of months instead of years. Procedures which appeared sound and adequate several months ago on the basis of experience up to that time have had to be modified in the light

of scientific and technical data now available.

The increase in scientific knowledge from this experience has been considerable. The Public Health Service is in a position to use the experience of recent months, superimposed upon experience of past years, as a basis for extending and improving its biologics control functions.

The Public Health Service's new measures are discussed below:

#### *Amendment of Minimum Requirements*

The minimum requirements for vaccine production and testing have been revised to provide a substantially greater margin of safety. Essentially, these changes provide for a required uniformity of sampling, which should provide a more uniform sensitivity of the test, and application of more tests at two critical points in the manufacturing process. One of these is a tissue culture test for virus, using samples of final container material to exclude contamination incidental to breaks in manufacturing routine subsequent to clearance of the trivalent pool. These and other less formal changes incidental to the recent review of the total manufacturing process will reduce still further the possibility that tested and released vaccine could contain sufficient active virus to be harmful to man.

In using any preventive or therapeutic substance, some risk always exists. This risk must be negligible in comparison with the hazard of a disease like poliomyelitis. Although the Salk vaccine has generally shown a remarkable degree of safety, the amended requirements still further reduce the risk involved in its use.

#### *Incorporation as Mandatory Standards*

The amended requirements for poliomyelitis vaccine will be incorporated in official regulations to establish their status as mandatory standards. In the past, these minimum requirements served only as guides which, however, have been fully accepted and applied.

#### *Creation of a Technical Committee*

The Surgeon General on May 25, 1955, created a standing expert advisory committee on poliomyelitis vaccine. The members of this committee are Drs. David Bodian, Thomas Francis, Jr., Jonas Salk, Richard Shope, and

Joseph Smadel, with Dr. James A. Shannon, associate director of the National Institutes of Health, as chairman. The committee was made responsible for: (a) formulating recommendations on measures to assure improved safeguards and greater effectiveness of the Salk vaccine, (b) recommending release of lots of vaccine, and (c) fostering collaborative research by industry, the National Institutes of Health, and university scientists on problems which must be solved in connection with vaccination against poliomyelitis.

### *Creation of a Division of Biologics Standards*

The Public Health Service biologics control program has operated heretofore as a constituent laboratory within one of the large research programs of the National Institutes of Health—the National Microbiological Institute. Now the Surgeon General has requested authority to organize expanded biologics function, with the status of a separate division in the National Institutes of Health, to be called the Division of Biologics Standards. The Secretary of Health, Education, and Welfare has approved this request.

This step is taken as the culmination of developments in medical research related to: (a) the expanding range of diseases to which biological products may be applicable, (b) the kinds of new biologics which may be available, particularly in the field of virology, and (c) the compressed time interval between the discovery of new biologics and their use.

The principles utilized in the control of virus infections successfully applied to the Salk vaccine offer promise of solutions to a hitherto baffling group of disease problems. The so-called "wonder drugs"—antibiotics and sulfa compounds—have made little impression on the problems of virus infection. We can expect the development of potent new biologics which will have unprecedented application, particularly to control of virus diseases.

The fact that new products are developed, tested, and used over progressively shorter time periods is one of the boons of modern medical research. But it creates an essentially new set of tasks in the field of biologics control. The new tasks can be performed more effectively under the new arrangement.

The change also removes the biologics control activity from a framework in which emphasis has been on research not primarily related to biologics control. As a separate division, the staff will have both a clearer mandate and a better opportunity to conduct such research as is essential to deal with trends, advances, and problems in biologics.

The professional staff of the new division will be augmented. Broader professional coverage will be provided by the addition of senior members to the staff. The division will also be strengthened by additional facilities and by augmented administrative and statistical services.

### *Onsite Plant Surveillance and Consultation*

Public Health Service staff members and expert part-time consultants drawn largely from university research centers will conduct a program of surveillance and technical consultation in the plants of the manufacturers while vaccine is under production. These scientists will collect information for the division and will foster collaborative work deemed essential by the Technical Committee on Poliomyelitis Vaccine. Similar procedures will be followed as other problems of biologics control arise in the future.

### *Expanded Testing and Research Program*

The testing program of the new division will be directed primarily toward determination of the exact significance of safety and potency tests, and modification of tests and their interpretation to make test data yield more penetrating information.

When an industrial product must meet highly precise standards, whether the product be a jet engine or a biologic, primary dependence is placed on "tests in process" rather than tests of the final product. A final test must be made, but it is in no sense a substitute for the many tests conducted along the way.

Great emphasis will not be placed on simple repetition of the testing already done in industrial laboratories since this adds little to the safety factor. The mechanism of onsite plant consultation, described above, will determine that such testing is well done, and will interpret critically the test results.



The development and interpretation of these tests is of paramount importance in controlling safety and potency. Much remains to be learned about their underlying significance. These questions, for example, are not now answerable: How long must a tissue culture be watched before definitive readings can be taken? What is the effect of calf serum on virus growth in tissue culture? How can the monkey safety test be made more sensitive? Resolution of questions of this sort is better calculated to insure the safety of virus vaccine than are any number of repetitive tests. Working toward their solution will be a major responsibility of the new division.

### *Poliomyelitis Surveillance Unit*

The Public Health Service has established a nationwide network for supplying precise and

current information on poliomyelitis cases, and for obtaining from collaborating university laboratories effective laboratory support for epidemiological studies. The purpose is to study vaccine performance.

### *Review of Legislative Authority*

The Biologics Control Act was passed in 1902, and amendments since then have not fundamentally altered the basic act. The terms of the act are being carefully reviewed in the light of the increasing complexity and scope of the biologics control function. If amendments appear advisable, recommendations will be made to the Congress. In this connection, it is to be emphasized that industrial cooperation, particularly in the course of the recent review of the processes of the six manufacturers, has been excellent.

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## Calendar of Vaccine Standards and Distribution

**July 1953.** In preparation for the expected clinical trial of the poliomyelitis vaccine developed by Dr. Jonas Salk under the auspices of the National Foundation for Infantile Paralysis, Dr. William G. Workman, chief of the Public Health Service Laboratory of Biologics Control, visited the Connaught Laboratories in Toronto, Canada, to discuss and observe techniques for growing bulk poliomyelitis virus.

**December 1953.** Dr. Joseph Smadel, Army Medical Services Graduate School, and Dr. Workman consulted with the National Foundation for Infantile Paralysis in the preparation of provisional standards for the manufacture of poliomyelitis vaccine. These standards, derived largely from the experience of Dr. Salk in making an experimental vaccine in his own laboratories, were designed as a guide for industry in the preparation of vaccine for the field trial.

**February 1954.** The provisional standards were sent by the National Foundation for Infantile Paralysis to 10 manufacturers with demonstrated competence and experience

in the production of biological products, inviting them to make poliomyelitis vaccine for the field trial. Two of these (Parke Davis and Lilly) had been in experimental production since the fall of 1953, working collaboratively with Dr. Salk. Five manufacturers responded, Parke Davis, Eli Lilly, Cutter, Wyeth, and Pitman-Moore. (Later, Sharp and Dohme elected to enter the field, making a total of six manufacturers.) The vaccine they were to produce was experimental, on contract to the National Foundation for Infantile Paralysis, and to be used only for investigative purposes.

**February 1954.** The Laboratory of Biologics Control had agreed in late 1953 to cooperate in testing the vaccine, at the request of the National Foundation. In February 1954, it began participation in triplicate safety testing of the experimental vaccine, receiving large numbers of test samples. This triplicate testing was done to gain experience in safety testing and to take advantage of the opportunity to further developmental research on a biological product. The National Foundation agreed that no vaccine would

be used in the field trial until polyvalent pool material, taken prior to division and final bottling, had been tested for safety in the manufacturer's laboratory, Dr. Salk's laboratory, and the Laboratory of Biologics Control and after approval by the Vaccine Advisory Committee of the National Foundation for Infantile Paralysis.

**March 1954.** At the request of the National Institutes of Health, a series of meetings was held with National Foundation representatives, Dr. Salk, the Vaccine Advisory Committee, and the manufacturers. Two out of the first 6 lots of experimental vaccine tested in the Laboratory of Biologics Control had failed in safety tests, and an additional 2 had failed the manufacturer's tests, indicating the presence of active poliomyelitis virus in the vaccine. The Vaccine Advisory Committee resolved to delay the initiation of the field trials for 4 weeks to permit a review of the vaccine tested during the extra time and to enable Dr. Salk to complete inoculation studies on some 7,500 children in the Pittsburgh area who were given commercially produced vaccine.



**April 1954.** The Vaccine Advisory Committee of the NFIP reconvened in Washington. Representatives of the National Institutes of Health and the manufacturers were present. The data on the vaccines produced and tested since the March meeting (10 batches in number) were considered, together with Dr. Salk's data concerning the 7,500 inoculated children. All results were of a negative character, and the committee recommended that the field trial proceed. The statement issued following the meeting, which was concurred in by the Public Health Service, contained the following statement: "... the possibility of infectious activity remaining in any vaccine meeting the specifications and minimal requirements has been reduced to a point below which it cannot be measured by practicable laboratory procedure."

**May 1954.** The field trial was begun, using vaccine supplied by Parke Davis and Eli Lilly. Three other manufacturers (Cutter, Wyeth, and Pitman-Moore) produced lots of material which passed the tests, but the National Foundation's decision was to use the vaccine from the two largest producers only in order to reduce variability from multiple manufacturers. The Public Health Service officially indicated a belief in the sound judgment of the Vaccine Advisory Committee in its recommendation to the NFIP to conduct the field trial.

**May 1954.** A document entitled "Minimum Requirements, Poliomyelitis Vaccine" was prepared by the Laboratory of Biologics Control with the advice and cooperation of the manufacturers and Dr. Salk. This was distributed to vaccine manufacturers and interested parties as a guide to prospective standards if the product were later to be licensed.

**July 1954.** The inoculation phase of the field trial was completed. The results, which were not available until April 12, 1955, indicated that there was no evidence of disproportionate frequency of paralytic poliomyelitis in vaccinated children up to 4 weeks after injection, nor of selective localization of paralysis.

**August 1954.** The National Foundation for Infantile Paralysis contracted with Dr. Thomas Francis, Jr., University of Michigan School of Public Health, for analysis of the data derived from the field trial. It was understood that his results could not be expected before March or April 1955. The Public Health Service provided about 20 epidemiologists and statisticians to assist Dr. Francis with his study.

**August 1951.** The National Foundation placed orders with the five manufacturers for the purchase of up to 27 million cc. of vaccine. This was done to encourage the manufacturers to stay in production after the field trial.

**September 1954.** Beginning in this month, and continuing through to January 1955, the Laboratory of Biologics Control inspected the plants of each of the six vaccine manufacturers except for one that had been inspected in July (Wyeth). These were general inspections required by regulations and included attention to poliomyelitis vaccine production plans and facilities.

**November 1954.** Two meetings, attended by representatives of the National Foundation, the manufacturers (including Sharp and Dohme, which had now entered the field), NIH staff, and representatives of the Connaught Laboratories in Toronto, Canada, were held in Pittsburgh to discuss deterioration of potency in some lots of vaccine. This was learned through tests made on vaccine left over from the NFIP field trial, and it was believed to be caused by merthiolate which was used as a preservative in the vaccine. This problem was then intensively studied by all concerned, with a view to preventing the deleterious effect of merthiolate or selecting another preservative which did not have this action. The manufacturers had to discard several millions of doses of vaccine containing merthiolate, produced by that time.

**December 1954.** The Laboratory of Biologics Control advised the manufacturers, the National Foundation, and Dr. Salk that, before licensing, it would require additional

clinical data on vaccine prepared without merthiolate since it was technically a different product from the one used in the field trial. Data supplied on 6,000 children injected with nonmerthiolated vaccine indicated that the vaccine without merthiolate was safe and potent. (An additional 3,000 were reported injected by Dr. Salk, but no data were submitted to the Laboratory of Biologics Control).

**January 1955.** The manufacturers began to submit to the Laboratory of Biologics Control protocols and samples of their first production lots of vaccine in anticipation of a favorable report on the results of the field trials. The Laboratory of Biologics Control began review of protocols and testing of materials well in advance of the expected date of actual licensing and of the official establishment of minimum standards for potency in order that vaccine might be available for the summer of 1955, should field trial results be favorable.

**April 1955.** By April 12, 1955, a total of 40 protocols with samples had been submitted to the Laboratory of Biologics Control. Six regular production lots had been fully tested in monkeys and in tissue culture by the Laboratory of Biologics Control with negative results. Additional tissue culture tests had been run on some other lots. Sterility tests were run on all lots. Protocols on all lots were reviewed independently by two or more Laboratory of Biologics Control scientists to determine conformity with the minimum requirements.

**April 5, 1955.** The director of the National Institutes of Health and the chief of the Laboratory of Biologics Control visited Dr. Francis in Ann Arbor, Mich., to discuss any preliminary data from the analysis of the field trial which would have a bearing upon the minimum requirements and licensing. The immediate need was for data permitting establishment of criteria for acceptable potency levels for poliomyelitis vaccine, some lots of which had already been submitted for release. This information from Dr. Francis was sup-

plemented by personal communications with Dr. Salk.

**April 7, 1955.** New draft requirements for potency standards were transmitted to the manufacturers.

**April 12, 1955.** At Ann Arbor, Mich., Dr. Francis announced the results of the analysis of field trials carried out in 1954 under the auspices of the National Foundation.

**April 12, 1955.** The Laboratory of Biologics Control issued the first official minimum requirements for poliomyelitis vaccine, revising the provisional minimum requirements issued in May 1954 to include standards for potency and a requirement that the manufacturer show that any preservative added to the finished vaccine causes no appreciable loss of potency within the period during which the vaccine may be used.

**April 12, 1955.** A group of special consultants met with the chief of the Laboratory of Biologics Control in Ann Arbor, to review the report of Dr. Francis and the minimum requirements and to make recommendations as to the licensing of Salk poliomyelitis vaccine. They agreed unanimously that the evidence available warranted licensing of the vaccine.

**April 12, 1955.** The Secretary of Health, Education, and Welfare issued to six companies (Parke Davis, Eli Lilly, Wyeth, Cutter, Pitman-Moore, and Sharpe and Dolme) licenses to manufacture poliomyelitis vaccine. The Secretary took this action on the recommendation of the chief of the Laboratory of Biologics Control, transmitted through and approved by the Surgeon General of the Public Health Service.

**April 12-13, 1955.** The first lots of poliomyelitis vaccine were released by the Laboratory of Biologics Control after having met the new minimum requirements. Thirteen lots of vaccine (6 Cutter, 2 Eli Lilly, 3 Parke Davis, and 2 Pitman-Moore) were approved. This rapid action was possible because the protocols and samples had been received in advance.

**April 27, 1955.** By this date, 40 lots of vaccine containing a total of 10.5 million cc. had been released. (This represents volume prior to final bottling. There is 15- to 20-percent shrinkage in filling due to overfilling and other causes.) Of this total, nearly 5 million cc. were used in first injections (approximately 4½ million under the National Foundation program and one-half million by others with vaccine distributed through commercial channels).

**April 26, 1955.** The Laboratory of Biologics Control received word of five cases of paralytic poliomyelitis in California among children who had received Cutter vaccine. There had been one earlier case in Chicago within the previous 24 hours. The incidence seemed to be above the rate expected from natural infection, and there was correlation between the site of injection and the paralysis.

**April 27, 1955.** Following advice from the National Institutes of Health staff, who held a telephone conference with a group of advisers, the Surgeon General requested Cutter to withdraw its vaccine from use. The Cutter Laboratories agreed to do so, and within less than an hour notified all their distributors to recover all of their unused vaccine.

**April 27, 1955.** The National Institutes of Health sent two experts in virology and in the operation of biologics production plants to make an examination of the Cutter Laboratories and report on all details of their laboratory processing and testing. A sanitary engineer assisted in some of the later phases of the inspection. This team was also directed to check the recovery of all unused Cutter vaccine.

**April 28, 1955.** The Public Health Service set up a special Poliomyelitis Surveillance Unit in the Communicable Disease Center, Atlanta, Ga., for rapid investigation of all cases reported as poliomyelitis. A nationwide epidemiological network was established through State and local health officials. This was supplemented by cooperating laboratories for recovery, identification, and typing of viruses. The Poliomyelitis

Surveillance Unit was directed to make daily reports to the Surgeon General and State health and other medical officials.

**April 28, 1955.** The Laboratory of Biologics Control (later augmented by 16 cooperating laboratories) began a series of tests on all Cutter vaccine, seeking to determine whether active virus could be detected. Meanwhile, testing of vaccine from other manufacturers continued.

**April 29-30, 1955.** An advisory group of advisers, 11 of the Nation's outstanding virologists and immunologists, was convened at the National Institutes of Health to review the situation and make recommendations on necessary action. By this time there were 17 reported cases of paralytic poliomyelitis among children injected with vaccine from the Cutter Laboratories. The group viewed protocols submitted on Cutter vaccine, discussed the situation with senior technical representatives from each of the six vaccine manufacturers, and submitted a unanimous report. The most important findings were that: (a) the action of the Public Health Service in recalling the Cutter vaccine was justified; (b) the continuation of vaccinations with the product of other manufacturers was warranted; (c) careful epidemiological and laboratory studies should be continued and extended; (d) it was probable that method of production and testing could be improved; and (e) a small committee of experts should study the minimum requirements to determine if changes were indicated.

**April 30, 1955.** Based on the recommendations listed above, the chief of the Laboratory of Biologics Control concluded that he could not prove any additional lots of vaccine until the review of the minimum requirements could be completed; he so advised the manufacturers. At this time, action was being withheld on a total of 3.9 million cc. of vaccine for which samples and protocols had been submitted but about which additional information had been requested by the Laboratory of Biologics Control, and on 330,000 cc. s

mitted for clearance a day before the meeting on requirements.

**May 5-6, 1955.** A six-member subcommittee of the April 29-30 ad hoc advisory group was convened at the National Institutes of Health to consider the adequacy of the minimum requirements, including the precise method of vaccine production and testing, the basis for decisions reached by review of protocols, and related matters. Technical representatives of all six vaccine manufacturers attended part of the meeting; they provided detailed data on their total manufacturing experience, including lots of material on which protocols had never been submitted for approval because of failure to meet requirements during processing. The subcommittee: (a) noted the accumulating epidemiological evidence of significant association between Cutter vaccine and the occurrence of paralytic poliomyelitis and the absence of evidence implicating poliomyelitis vaccine produced by the other manufacturers; (b) stated the desirability of increasing the margin of safety in the vaccine (they prepared a tentative draft for revision of the minimum requirements); and (c) believed it might be well to withhold further injections until a team of scientists could visit each plant and study the production processes, facilities, records, and protocols in the light of what was now known about the experience of the various manufacturers.

**May 7, 1955.** The Surgeon General recommended to the medical and public health professions that vaccinations should be suspended pending completion of study of the recommendations.

**May 8, 1955.** In a detailed statement, the Surgeon General repeated his recommendation that new vaccinations should not be given for the time being and announced that the manufacturers' production and testing procedures and facilities would be inspected by a team of scientists on a plant-by-plant basis, in the order of their entry into the poliomyelitis vaccine production field.

**May 13, 1955.** Based on the recommendations of the inspection team at Parke Davis, followed by a careful analysis of their protocols at the National Institutes of Health, approximately  $4\frac{1}{2}$  million cc. of Parke Davis vaccine already released were recleared. Of this supply approximately 1 million cc. remained unused. Clearance on one lot previously approved, but as yet unused, was withheld.

**May 15, 1955.** A scientific review panel meeting at the National Institutes of Health, hearing the report of the plant inspection and reappraising the protocols on Ell Lilly vaccine, cleared approximately  $3\frac{1}{2}$  million cc. of Lilly vaccine previously released; of this, only about 378,000 cc. remained unused. The Parke Davis lot on which reclearance was withheld on May 13 was ordered withdrawn, and an additional Parke Davis lot was released. The group also suggested modifications of the manufacturing and testing processes of all manufacturers seeking to build in additional factors of safety.

**May 15, 1955.** An ad hoc group of epidemiological advisers met at the National Institutes of Health simultaneously with the group on revisions of the minimum requirements. At that time at least 54 cases of paralytic poliomyelitis appeared to be associated with the Cutter vaccine. The group felt: (a) that there might possibly be some correlation in a few children receiving the product of another manufacturer; and (b) that the number of sibling or parental contact cases following vaccination of a member of the household warranted careful and continuing check.

**May 16, 1955.** The director of the National Institutes of Health reported to the Surgeon General that two manufacturers, after a long period of producing consecutive lots of vaccine that met all requirements, had recently experienced difficulty getting consistent results. Under the proposed revisions of the minimum requirements, which were under consideration, some of these lots of vaccine could not be approved.

These manufacturers were withholding request for clearance of a large amount of vaccine pending a clarification of this problem. This forecast production delays which would require revision in the expected vaccine supply in the immediate future.

**May 16-20, 1955.** A Public Health Service team of scientists and advisers visited the Wyeth and Pitman-Moore plants. Although the manufacturing techniques and professional competence of the firms were excellent, it was concluded that no action would be taken on reclearance of their vaccine until there could be an opportunity to assess all the data from all the plants and reach conclusions on the factors that should govern release of vaccine already processed as well as steps that might be built into the manufacturing and testing processes as additional safeguards in the future.

**May 20, 1955.** A special advisory group met at the National Institutes of Health to consider questions of dosage and use of vaccine during epidemics. The dosage question was considered because of some experimental evidence suggesting that injecting 0.1 cc. of vaccine intradermally instead of 1 cc. intramuscularly might be effective. The group, after reviewing all the data, recommended the following: (a) adherence to the existing dosage and route of injection, based on evidence of the vaccine's protective value during the 1954 field trials; (b) approval of extension of time between first and second dosage of vaccine to 5-6 weeks if necessary; and (c) caution concerning use of injections during or near epidemic periods or in areas of high prevalence, with decisions made by local authorities.

**May 23, 1955.** Members of the Vaccine Advisory Committee of the National Foundation for Infantile Paralysis, the American Medical Association, and the Association of State and Territorial Health Officers met at the National Institutes of Health and were given a review of the poliomyelitis immunization and vaccine situation.

**May 25, 1955.** An amendment to the minimum requirements was decided upon and discussed in detail with the vaccine manufacturers' technical representatives, who were also given summary information on the current epidemiological picture, the data derived from the five plant inspections, and the analysis of the sensitivity and reliability of the safety tests as performed under the existing minimum requirements. The executives of the manufacturing firms were asked to study the revised standards further and be prepared to bring their technical staff chiefs to a meeting the following day for final discussions.

**May 26, 1955.** A new, permanent advisory group was established by the Surgeon General and held its first meeting at the National Institutes of Health. Called the Technical Committee on Poliomyelitis Vaccine, this group was asked to perform two functions: to advise on the release of vaccine under the minimum requirements as amended, and to give continuing guidance in vaccine production and testing with particular emphasis on research leading to improvements and refinements in the vaccine.

**May 27, 1955.** The representatives of all six firms declared their individual support of the amended requirements in the interest of making a safer vaccine, and the Surgeon General made public announcement of this fact. Industry was asked to provide the Public Health Service with revised estimates predicting the amount of vaccine they might be able to make available this summer under the amended requirements.

**May 27, 1955.** In a press conference at the National Institutes of Health, Public Health Service officials made public the details of the amendments to the minimum requirements and their possible implications in regard to availability of vaccine. It was stated that there would be a net slowdown immediately; that the revisions did not entail any consequential lengthening of the total manufacturing process,

once placed in use in each plant; and that small amounts of vaccine would probably be made available beginning early in the week of May 30 and progressively thereafter.

**June 1, 1955.** The reclearance of 200,000 cc. of vaccine manufactured by Pitman-Moore and by Wyeth was announced. Surgeon General Scheele also stated that "no important differences were found in the quality of performance or the scientific caliber of the manufacturers now releasing the vaccine for general use."

**June 9, 1955.** A new Division of Biologic Standards was established at the National Institutes of Health. The biologics control program heretofore was the responsibility of a laboratory of the National Microbiological Institute.

Increasingly complex problems in the biologics field, among them the virus vaccines, made establishment of the new organization necessary, Dr. Scheele stated.

**June 10, 1955.** A detailed technical report [parts of which are published in this issue—Ed. note] was presented by Surgeon General Scheele to Secretary Hobby and made public.

**June 22, 1955.** The following recommendations on vaccine distribution were made by the National Advisory Committee on Poliomyelitis Vaccine (under the chairmanship of Dr. Chester S. Keefer, special assistant to Secretary Hobby):

(1) When the available supply of vaccine warrants changes in the designated age group to whom immunization is limited, such adjustments will be made by extending the existing priority group so that it becomes increasingly broader; (2) For the time being, the 5 through 9 priority age group should be adhered to. As vaccine becomes available, the committee will broaden the age group to include equal additions below and above this group to the extent that production of the vaccine indicates; (3) Since success of the voluntary plan depends largely upon the development of effective intrastate

plans, States should take immediate action to develop and implement plans to assure equitable distribution within their respective populations; (4) In order to insure equitable distribution, plans for intrastate distribution of the vaccine should include a system for obtaining reports of shipments from the manufacturers and reports of sales from retail outlets; (5) A coordinated nationwide educational campaign should be developed to assist health departments and physicians in keeping the public informed about the poliomyelitis vaccine program.

**July 8, 1955.** The Public Health Service announced the release of 300,000 cc. of Wyeth vaccine, making a total of about 1,837,000 cc. made available since the revision of testing requirements on May 26. Since April 12, the total released was approximately 10,837,000 cc. The Division of Biologic Standards assigned 6 scientists to the plants of the 6 manufacturers to serve as technical aides on production and testing procedures, and in research development.

**July 8, 1955.** Surgeon General Scheele announced the formulation of a tentative program for developmental research aimed at discovering new knowledge immediately applicable to further improvement of production and testing of poliomyelitis vaccine. The program will consider other strains of poliomyelitis virus for inclusion in the vaccine, improved tests for potency, the improvement of monkey safety tests, the development of concentration methods for use both in safety testing and in routine production processes, and studies on standardization of tissue culture susceptibility to poliomyelitis virus. The research plans call for a positive, cooperative endeavor, in which university, industrial, and government laboratories combine to concentrate their research resources. This program is expected to gear in with programs supported by the National Foundation for Infantile Paralysis and other organizations sponsoring similar and related research.

# Functional Distribution of Working Time in a State Health Department

By EDWARD M. COHART, M.D., and WILLIAM R. WILLARD, M.D.

TO SUPPLEMENT the data obtained in a time study in five county health departments in Maryland (1), the Yale Public Health Personnel Research Project conducted a similar study in the Maryland State Department of Health. The time study in the State health department, as in the county units, sought to measure the allocation of working time to each of 21 functional categories of activity, using a technique developed by the project (2). Time studies were considered an essential part of the Yale project, which attempted to learn what public health workers actually do on the job in the belief that such information is a necessary prerequisite to any recommendations concerning recruitment, training, or utilization of personnel.

Participating in the study in the State health department were 137 professional and semi-professional workers, 88 percent of those meeting the standards set by the project (3). They were classified according to service, which is

usually but not always synonymous with professional affiliation, as follows: medical service, 12; nursing service, 10; sanitation service, 29; laboratory service, 40; secretarial service, 21; and other services, 22. Time logs were kept for 2 days each month from September 1952 through January 1953, the days of the week and the weeks of the month being staggered so that the data would be representative of the 5-month period. Information as to place in the administrative hierarchy, educational background, and salary was obtained from each worker through interviews.

## The Working Day

The average daily elapsed time on the job, on the basis of a 5-day week, was 8 hours and 22 minutes. Sixty-two minutes of this time were employed in personal activities, such as sick leave, meals, coffee hours, and rest periods, leaving an effective working day of 7 hours and 20 minutes.

The average working day for physicians, nurses, and sanitation workers was approximately 1 hour longer than that for statistics, secretarial, and laboratory personnel. There was an 80-minute spread in the length of the working day in accordance with administrative level of the workers: Program directors had the longest working day; supervisors and staff-level personnel, the shortest.

For all personnel included in the study, the working time was apportioned among four major groups of activity as follows: 30 percent

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to technical activities (usually direct service activities requiring professional or technical training); 37 percent to ancillary activities (essential but usually routine, stereotyped activities for which training can be acquired on the job or in a short training course); 21 percent to administration (program planning, management, giving and receiving supervision and education or training); and 11 percent to community relations and organization (activities with other agencies, public information and education, and giving professional education). A detailed analysis of the time spent in these activities in relation to service affiliation, administrative level, level of education, amount of public

health training, and salary is presented below and in the accompanying tables.

### Technical Activities

Sanitation personnel devoted more time than other workers to technical activities (table 1). More than 50 percent of the sanitation workers' time was spent in these activities, as compared with about 40 percent of the laboratory workers' time and less than 25 percent of the nurses' and physicians' time. Only 3 percent of the time of the secretarial personnel was spent in technical activities.

Staff-level personnel devoted almost twice as

**Table 1. Percentage of working time devoted to each of 20 activity categories, by service, in the Maryland State Department of Health**

Activity category	Service						
	Medi- cal	Nurs- ing	Sani- tation	Labora- tory	Secre- tarial	Other	All
Technical activities.....	18.6	23.3	51.5	39.4	2.6	25.1	30.2
Ancillary activities.....	13.0	13.8	16.3	47.7	80.4	31.4	37.3
Administration.....	34.3	49.5	17.6	10.0	8.9	31.7	20.9
Program planning within health department.....	13.1	6.5	5.0	3.0	.7	2.0	4.1
Giving supervision and training.....	6.2	30.4	3.8	4.3	3.5	12.8	8.0
Giving personnel supervision.....	4.6	4.8	2.8	2.2	3.2	7.4	3.8
Planning and giving individual inservice training.....	.7	18.2	.8	2.0	.1	3.0	2.8
Planning and giving group inservice training.....	.9	7.4	.2	.1	.2	2.4	1.4
Receiving supervision, education, and training.....	7.5	10.3	7.5	1.5	2.9	5.7	5.1
Supervision.....	.1	.4	1.5	.1	2.0	1.1	.9
Education and training.....	7.4	9.9	6.0	1.4	.9	4.6	4.2
Management.....	7.5	2.3	1.3	1.2	1.8	11.2	3.7
Personnel.....	2.4	1.8	.3	.6	.7	2.7	1.2
Financial.....	3.7	.3	.4	.1	.3	5.8	1.5
General services.....	1.4	.2	.6	.5	.8	2.7	1.0
Community relations and organization.....	33.6	13.1	13.4	2.3	6.6	10.0	10.6
Activities with other agencies.....	20.1	9.0	5.8	1.0	2.3	6.2	5.6
Joint program planning.....	7.5	5.2	2.9	.1	1.0	3.3	2.5
Activities with other agencies, except health de- partments.....	9.1	2.0	2.1	.9	1.1	1.6	2.2
Activities with other health departments.....	3.5	1.8	.8	0	.2	1.3	.9
Public information and education.....	4.1	1.2	7.0	.8	4.3	3.1	3.5
Information services.....	2.3	.6	6.6	.8	4.0	1.5	2.9
Planning mass media.....	.8	.3	0	0	.3	1.0	.3
Talks to public.....	.4	.2	.3	0	0	.6	.2
Group organization.....	.6	.1	.1	0	0	0	.1
Giving professional education.....	9.4	2.9	.6	.5	0	.7	1.5
Social activities.....	.4	.3	1.0	.3	1.6	1.7	.9

**Table 2. Percentage of working time devoted to each of 20 activity categories, by administrative level, in the Maryland State Department of Health**

Activity category	High-echelon personnel						Staff-level personnel		
	Health officer	Program director and assistant program director	Administrative assistant	Consultant	Supervisor	All high-echelon personnel	Senior staff	Junior staff	All staff-level personnel
Technical activities.....	8.0	20.5	4.7	18.7	24.8	19.7	34.3	36.2	35.9
Ancillary activities.....	16.7	13.4	56.7	16.6	53.8	21.6	40.1	46.7	45.7
Administration.....	34.7	41.2	16.1	47.6	15.2	37.7	20.5	10.1	11.6
Program planning within health department.....	18.1	8.7	1.0	8.6	.2	7.3	6.1	1.7	2.4
Giving supervision and training.....	0	11.7	8.7	32.2	12.5	15.8	9.2	2.8	3.7
Giving personnel supervision.....	0	6.6	5.5	5.6	6.9	6.3	3.1	2.3	2.4
Planning and giving individual inservice training.....	0	1.7	3.2	19.2	5.0	5.9	5.8	.3	1.1
Planning and giving group inservice training.....	0	3.4	0	7.4	.6	3.6	.3	.2	.2
Receiving supervision, education, and training.....	0	9.5	.6	5.5	1.1	6.9	3.2	4.2	4.1
Supervision.....	0	.9	.3	0	.6	.6	1.4	1.0	1.1
Education and training.....	0	8.6	.3	5.5	.5	6.3	1.8	3.2	3.0
Management.....	16.6	11.3	5.8	1.3	1.4	7.7	2.0	1.4	1.4
Personnel.....	6.5	3.9	2.9	1.2	1.4	3.0	.5	.2	.2
Financial.....	10.1	5.3	2.9	0	0	3.5	.2	.5	.4
General services.....	0	2.1	0	.1	0	1.2	1.3	.8	.8
Community relations and organization.....	40.5	24.2	21.0	16.3	2.8	19.9	4.6	6.0	5.7
Activities with other agencies.....	26.1	16.2	6.6	10.3	1.1	12.7	2.5	1.8	1.8
Joint program planning.....	16.7	7.7	2.2	4.7	1.1	6.1	0	.7	.6
Activities with other agencies, except health departments.....	2.9	6.3	2.6	3.8	0	4.7	2.5	.6	.8
Activities with other health departments.....	6.5	2.2	1.8	1.8	0	1.9	0	.5	.4
Public information and education.....	13.0	3.5	15.4	1.5	.6	3.4	1.5	4.0	3.6
Information services.....	2.9	1.7	15.4	.6	0	1.9	1.3	3.8	3.4
Planning mass media.....	9.4	.6	0	.6	.6	.7	.2	.1	.1
Talks to public.....	0	.8	0	.2	0	.5	0	.1	.1
Group organization.....	.7	.4	0	.1	0	.3	0	0	0
Giving professional education.....	1.4	4.5	0	4.5	1.1	3.8	.6	.2	.3
Social activities.....	0	.6	.2	.9	3.2	1.0	.5	1.0	.9

much time as high-echelon personnel to technical activities (table 2).

Workers who had a bachelor's degree tended to devote somewhat more time to technical activities than those without a degree (table 3), but workers with either a graduate degree or undergraduate training in public health devoted less time to these activities than did those who had not had such training (table 4).

Salary was not directly associated with time spent in technical activities (table 5).

### Ancillary Activities

Laboratory workers devoted appreciably more time to ancillary activities than did any other professional workers (table 1). They spent almost 50 percent of their time in these activities,



whereas the medical, nursing, and sanitation workers were similarly engaged only 13 to 16 percent of the time. Secretarial personnel spent 80 percent of their time in ancillary activities.

Almost 50 percent of the time of staff-level personnel and slightly more than 20 percent of the time of workers in the high administrative echelons was absorbed by ancillary activities (table 2). Among high-echelon personnel, supervisors appeared to be particularly burdened with these tasks.

About 60 percent of the time of workers without a college degree and 16 percent of the time of those with a college degree was spent in performing ancillary activities (table 3). An essentially similar relationship existed with respect to public health training (table 4).

Salary increased as participation in ancillary activities decreased (table 5).

### Administration

The 21 percent of the time of all personnel spent in performing administrative duties was apportioned among the four major categories as follows: 4 percent to intramural program planning, another 4 percent to management, 8 percent to giving supervision and inservice training, and 5 percent to receiving supervision, education, and training. As previously reported (1), the personnel in the five county health departments in Maryland spent 17 percent of their time in administration, the difference stemming from less participation in management and giving supervision and training.

Medical personnel, who devoted 34 percent of their time to administration, greatly exceeded the average (table 1). However, nurses spent even more time than medical personnel in administration, since half of their time was devoted to such activities. This extensive participation by nurses in administration was mainly a reflection of the fact that they devoted 25 percent of their time to giving individual and group inservice training, a percentage which was 12 times as large as that for the laboratory personnel and which exceeded that for the medical and sanitation personnel to an even greater extent. The percentage of time devoted to administration by the sanitation personnel was slightly below the average, while the laboratory

**Table 3. Percentage of working time spent in each of 20 activity categories, by level of education, in the Maryland State Department of Health**

Activity category	Less than bachelor's degree	Bachelor's degree	Graduate degree
Technical activities-----	23.4	41.1	33.0
Ancillary activities-----	60.5	15.8	17.5
Administration-----	8.7	32.6	30.7
Program planning within health department-----	1.3	4.6	7.9
Giving supervision and training-----	3.4	14.6	10.2
Giving personnel supervision-----	2.7	3.2	5.8
Planning and giving individual inservice training-----	.6	9.6	1.5
Planning and giving group inservice training-----	1.1	1.8	2.9
Receiving supervision, education, and training-----	2.5	6.8	7.8
Supervision-----	1.2	.7	.7
Education and training-----	1.3	6.1	7.1
Management-----	1.5	6.6	4.8
Personnel-----	.5	1.4	2.1
Financial-----	.4	3.5	1.7
General services-----	.6	1.7	1.0
Community relations and organization-----	6.4	9.1	17.9
Activities with other agencies-----	1.5	6.1	11.3
Joint program planning-----	.9	2.9	4.7
Activities with other agencies, except health departments-----	.5	2.6	4.3
Activities with other health departments-----	.1	.6	2.3
Public information and education-----	4.9	1.4	3.0
Information services-----	4.7	1.4	1.2
Planning mass media-----	.2	0	.7
Talks to public-----	0	0	.8
Group organization-----	0	0	.3
Giving professional education-----	0	1.6	3.6
Social activities-----	1.0	1.2	.6

and secretarial personnel spent about half the average percentage of time in these pursuits.

The most extensive participation in both program planning and management occurred in the



medical service, followed by the nursing, sanitation, and laboratory services, in that order. The percentage of time devoted to receiving supervision, education, and training was in excess of the average in the nursing, medical, and sanitation services and below the average for laboratory and secretarial workers.

High-echelon personnel devoted almost four times as much time to administration as did staff-level personnel (table 2). This ratio prevailed, in general, for the several categories of administration; it was highest for giving supervision and training and lowest for receiving supervision, education, and training.

Time devoted to administration was positively associated with level of education and with formal public health training. Workers with a bachelor's degree or a graduate degree devoted more than three times as much time as those without a college education to administration, with somewhat similar ratios prevailing for each of its major categories (table 3). Similarly, personnel with a graduate degree or undergraduate training in public health devoted 3 to 4 times as much time to administration as those without formal public health training (table 4). The somewhat higher percentage for personnel with undergraduate public health training than for those with a graduate degree in public health results from the fact that the former devoted a greater proportion of their time to giving supervision and inservice training. Graduates in public health, on the other hand, spent much more of their time in program planning and in personnel, financial, and general services management.

Workers in the highest salary bracket devoted more time than those in any other bracket to administration as a whole and to each of its major categories, with the exception of giving supervision and inservice training (table 5). In this category, personnel in the second highest salary bracket spent the most time.

#### Community Relations and Organization

Of the 11 percent of the time devoted to community relations and organization, 6 percent was spent in activities with other agencies; 4 percent, in public information and education; and 2 percent, in professional education.

**Table 4. Percentage of working time spent in each of 20 activity categories, by level of public health training, in the Maryland State Department of Health**

Activity category	No formal public health training	Undergraduate education	Graduate degree
Technical activities.....	31.8	14.1	18.9
Ancillary activities.....	39.9	5.6	19.6
Administration.....	17.3	68.9	42.9
Program planning within health department.....	3.2	8.0	14.0
Giving supervision and training.....	5.7	52.4	16.0
Giving personnel supervision.....	3.5	.3	9.1
Planning and giving individual inservice training.....	1.4	43.1	2.2
Planning and giving group inservice training.....	.8	9.0	4.7
Receiving supervision, education, and training.....	5.0	7.5	5.7
Supervision.....	1.0	1.1	.1
Education and training.....	4.0	6.4	5.6
Management.....	3.4	.9	7.2
Personnel.....	.9	.8	4.3
Financial.....	1.5	0	1.6
General services.....	1.0	.1	1.3
Community relations and organization.....	10.1	11.2	17.0
Activities with other agencies.....	5.0	8.4	12.4
Joint program planning.....	2.1	4.6	6.5
Activities with other agencies, except health departments.....	2.1	1.9	3.6
Activities with other health departments.....	.8	1.9	2.3
Public information and education.....	3.6	1.7	3.2
Information services.....	3.0	1.3	1.4
Planning mass media.....	.3	.4	.8
Talks to public.....	.2	0	.6
Group organization.....	.1	0	.4
Giving professional education.....	1.5	1.1	1.4
Social activities.....	1.0	.3	.7

Medical personnel were engaged in community relations and organization one-third of the time (table 1). They devoted 20 percent of their time to activities with other agencies and

**Table 5. Percentage of working time spent in each of 20 activity categories, by annual salary level, in the Maryland State Department of Health**

Activity category	\$2,000-\$2,999	\$3,000-\$3,999	\$4,000-\$5,999	\$6,000 and over
Technical activities-----	23.6	36.9	34.6	23.1
Ancillary activities-----	71.2	46.0	15.8	16.5
Administration-----	3.4	11.4	31.7	39.4
Program planning within health department-----	0	.7	7.5	9.5
Giving supervision and training-----	.6	5.3	15.9	9.3
Giving personnel supervision-----	.6	4.0	3.3	7.0
Planning and giving individual inservice training-----	0	.6	9.6	.5
Planning and giving group inservice training-----	0	.7	3.0	1.8
Receiving supervision, education, and training-----	1.8	3.3	6.0	9.2
Supervision-----	1.0	1.1	.8	.5
Education and training-----	.8	2.2	5.2	8.7
Management-----	1.0	2.1	2.3	11.4
Personnel-----	.2	.5	.9	3.4
Financial-----	.6	.3	.5	6.5
General services-----	.2	1.3	.9	1.5
Community relations and organization-----	1.3	4.1	16.8	20.2
Activities with other agencies-----	.5	1.5	7.7	14.2
Joint program planning-----	.1	.9	2.4	7.7
Activities with other agencies, except health departments-----	.4	.5	3.9	4.5
Activities with other health departments-----	0	.1	1.4	2.0
Public information and education-----	.8	2.4	7.3	3.0
Information services-----	.7	2.2	6.3	1.9
Planning mass media-----	.1	.2	.4	.6
Talks to public-----	0	0	.5	.3
Group organization-----	0	0	.1	.2
Giving professional education-----	0	.2	1.8	3.0
Social activities-----	.3	1.3	1.2	.6

10 percent to giving professional education. Nursing and sanitation personnel devoted about 13 percent of their time to community relations and organization, the nurses concentrating on activities with other agencies and the sanitation personnel, on public information and education. A relatively minute percentage of the time of laboratory personnel was devoted to community relations and organization. Secretarial personnel spent 7 percent of their time in these activities, more than half of it in public information.

High-echelon personnel spent four times as much time as staff-level workers in community relations and organization (table 2). The time spent by each of these two groups in public information and education was approximately the same, but the former spent considerably more time in activities with other agencies and in professional education.

Participation in community relations and organization increased with level of education and extent of public health training (table 3 and 4). The exception to this general finding was the relatively small percentage of time that workers with a bachelor's degree and those who had received undergraduate public health training devoted to public information and education.

Salary level was also positively associated with the extent of participation in community relations and organization (table 5). This held true for each of the major categories in this group, except public information and education. Workers in the second highest salary bracket were engaged in giving information to the public to a much greater extent than those in the other salary brackets.

### Summary and Discussion

Summarizing the data obtained in the time study in the Maryland State Department of Health, it can be seen that roughly one-third of the working time was devoted to technical activities; one-third, to ancillary activities; and one-third, to administration and community activities. This distribution is essentially similar to that found in the five county health departments in Maryland, but there were minor differences, as might be expected.

State health department personnel devoted

somewhat less time to technical activities and somewhat more time to administration than did the county personnel. Since a local health department has primary responsibility for direct health services, it would logically devote relatively more time than a State health department to direct service, or technical, activities.

On the other hand, the State health department, probably because of its larger and more complex organizational structure, devoted more time than did the local units to management. It also devoted more time to the training of personnel, principally because of its training programs for local workers.

Another interesting difference was in the apportionment of time to public and professional education. The county units were involved in public education to a much greater extent than the State health department; the State health department, however, devoted three times as much time as the county health departments to professional education.

As a general pattern, it was found that the extent of participation in administration and community activities in the State health department was positively associated with position in the administrative hierarchy, level of education, and public health training, in much the same fashion as was found in the county health departments. In another part of the Yale study, it will be shown that only infrequently are per-

sonnel adequately prepared for these duties in their general college education or in their education in public health.

The various services differed considerably as to the amount of time that they devoted to many of the functional activities. Sometimes, as in the case of the laboratory service, differences appeared to be the natural outcome of the duties of the service. More often, however, differences did not appear to be related inherently to the fundamental character of the responsibilities.

The whole question of the relative importance of the several types of activity currently performed by health departments is a question that warrants serious consideration. The Yale study served merely to report existing practices, as a basis for further study.

#### REFERENCES

- (1) Cohart, E. M., and Willard, W. R.: Functional distribution of working time in five county health departments—The Yale study. *Pub. Health Rep.* 70: 713-719, July 1955.
- (2) Cohart, E. M., and Willard, W. R.: A time study method for public health—The Yale study. *Pub. Health Rep.* 70: 570-576, June 1955.
- (3) Cohart, E. M., Willard, W. R., and Hiscock, W. McC.: A method for studying the public health worker and his job—The Yale study. *Pub. Health Rep.* 70: 447-452, May 1955.

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## Supply of Rhesus Monkeys

As result of negotiations, the United States Mission to India and the United States Embassy in India have secured the agreement of the Government of India to permit for the period ending June 30, 1956, the continued exportation of rhesus monkeys for medical research and production of antipoliomyelitis vaccine. All needs must be certified by the United States Government through the Public Health Service.

Information concerning Public Health Service procedure and Certificate of Need forms may be secured from: National Institutes of Health, Room 1012, Building T-6, Bethesda 14, Md.

# Experiments With Isoniazid As a Preventive Measure Against Tuberculosis

**I**SONIAZID, which has shown remarkable powers in the treatment of tuberculosis, shows promise of being equally potent as a preventive.

At the annual meeting of the National Tuberculosis Association in Milwaukee, May 23-27, 1955, Dr. Carroll E. Palmer and Shirley H. Ferebee, chief and assistant chief, respectively, of the Operational Research Branch, Tuberculosis Program, Division of Special Health Services, Public Health Service, presented their report, entitled "Experimental Studies on Prevention of Tuberculosis," in which they demonstrated the effectiveness of isoniazid as a preventive against tuberculosis in guinea pigs.

## Methods and Results

The studies incorporated these basic principles: large numbers of animal subjects, controls, random allocation of animals to treatment groups, and unbiased observations. About 1,250 guinea pigs were first isolated for 3 weeks. The death rate during this period was about 1 percent per week. The 1,224 living pigs were distributed into 5 comparable experimental groups.

In the drinking water of the first 3 groups were placed concentrations of isoniazid in amounts of 0.25, 0.05 and 0.01 milligram per milliliter, respectively. There were two groups of untreated pigs, one held for challenge and

one reserved as normal, uninfected controls. By weighing each animal every week and by measuring the amount of water consumed each day, it was found that the pigs drank a fairly constant amount of water every day. The amount of isoniazid taken daily in the 3 drug groups approximated 25, 5, and 1 milligram per kilogram of body weight.

All groups except the "normals" were challenged intraperitoneally with virulent tubercle bacilli. The normal pigs received a placebo challenge. The controls—those that received no isoniazid—died rapidly after the challenge infection, and by the 10th week only 7 percent remained alive. Eighty-eight percent of the normals—those that had not been infected—were still alive in the 10th week. The pigs that received 1 mg./kg. of isoniazid received some protection since they did not die as rapidly as the controls. Thirty-seven percent were still alive by the 10th week. The challenged pigs that received either 5 or 25 mg./kg. of isoniazid did not have a greater death rate than the normal pigs.

For the first 10 weeks after challenge with tubercle bacilli the daily dose of 5 mg./kg. was enough to protect the pigs against an infection that was sufficiently virulent to kill nearly all of the controls.

At this point, the investigators considered the problem of the effect of withdrawal of isoniazid. They withdrew the drug, 10 weeks after infection, from pigs selected at random in each of the three treatment groups. The pigs that had received 1 mg./kg. of isoniazid continued to fare better than the controls. The animals that had received 5 or 25 mg./kg. survived as well as the normal animals over a period of 26 weeks.

At the 26th week, 75 percent of the pigs that received at least 5 mg./kg. for only 10 weeks, 74 percent of those that received 5 or 25 mg./kg. for the entire 26 weeks, and 71 percent of the unchallenged normal controls were still alive. This part of the experiment appears to indicate that as little as 5 mg./kg. of isoniazid per day for only 10 weeks is sufficient to knock out a

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*Prepared by the Tuberculosis Program, Division of Special Health Services, Public Health Service. The report mentioned will be available upon publication in the American Review of Tuberculosis.*

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virulent tuberculosis infection in guinea pigs.

Fourteen weeks after the date of the first challenge, randomly selected parts of each group of animals that had received 5 and 25 mg./kg. were rechallenged. Part of the original group of normals were challenged at the same time to obtain a new group of controls.

The new, untreated controls died rapidly, as expected. The animals that survived the first challenge while receiving isoniazid and had then been taken off the drug after the first 10 weeks, when rechallenged, did not die as rapidly as the controls even though they were not receiving the drug. This evidence suggests that a relatively small amount of isoniazid in the drinking water of guinea pigs not only protects them from getting tuberculosis but also allows them to develop a certain amount of resistance to a later untreated infection. This resistance is at least as great as has been produced in guinea pigs by vaccination with BCG.

The pigs that received 5 or 25 mg./kg. of isoniazid continuously during two challenge infections survived as well as the normals that had never been challenged.

### Summary

A daily dose of isoniazid of not more than 5 mg./kg. of body weight, given in the drinking

water, is apparently sufficient to protect guinea pigs completely from a large intraperitoneal challenge of virulent tubercle bacilli. This dose given for only 10 weeks after a virulent challenge was sufficient to prevent the appearance of disease after the drug was discontinued. Resistance to a later virulent infection, at least equal to that produced by BCG vaccination, develops in guinea pigs during the course of an isoniazid-treated challenge.

Whether isoniazid will be effective as a preventive of human tuberculosis depends on the results of controlled trials in large population groups, which are now being planned. Continuing experiments with laboratory animals will provide additional information essential to trials among human beings. Isoniazid has been used extensively since 1952 in treating tuberculosis, and its effectiveness and harmlessness have been conclusively demonstrated. The drug can be produced easily in large quantities, and its cost is low. Persons who are reactors to tuberculin or persons who exhibit suspicious shadows on X-ray films might be the first to benefit from the preventive and curative properties of isoniazid. These findings may mean that whole populations could be treated for as little as a penny a day per person.

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## CDC Slide Series

A series of approximately 35 color slides with descriptive notes has been prepared by the Public Health Service Communicable Disease Center. These slides emphasize the importance of communicable disease in the United States today. They outline Federal and State organization for control and show several phases of the center's program activities, such as orientation lectures, training courses, and other public presentations. Latest statistics are interpreted in diagrammatic and flow charts. Actual photographs of program activities are included. The series is available on loan in either 2- by 2-inch or 3¼- by 4-inch size. Requests should be addressed to James A. King, Jr., Special Assistant for Operations, Communicable Disease Center, Public Health Service, Atlanta, Ga.

# Appraisal of Tuberculosis Case Finding

—Des Moines and Polk County, Iowa—

By ABRAHAM GELPERIN, M.D., Dr.P.H., LEON J. GALINSKY, M.D., and ALBERT P. ISKRANT, M.A.

IN an area and time in which the discovery rate of active tuberculosis is low, it is important to study present methods of case finding and diagnosis for program guidance.

How such a diagnosis becomes attached to a particular patient was the subject of a study of the tuberculosis control program in Polk County, Iowa. Our primary interest was in the succession of events leading to the definitive diagnosis among the 83 persons found to have active tuberculosis during the 2 years 1952 and 1953. The survey was undertaken in order to discover also to what extent the major case-finding methods were responsible for the diagnosis, the failures of accepted methods, some reasons for those failures, what might improve the application of current methods, and finally, whether new approaches should be introduced?

Des Moines and Polk County, Iowa, with a population of some 235,000 persons, have had a tuberculosis incidence pattern comparable to that in the rest of the State of Iowa. One health official directs the Des Moines City and Polk County Health Departments. The county

hospital has a tuberculosis unit of 87 beds. The medical director of the tuberculosis unit is responsible for the care and management of the patients during both their hospital and outpatient care.

Organized community case finding for tuberculosis operates in three major areas:

1. Screening: By use of a mobile X-ray unit, concentrated on industrial groups; and by tuberculin testing of segments of the school child population. During the past 5 years, some 66,000 photofluorograms have been made by the mobile unit. Two-thirds of these covered industrial groups. Annual tuberculin testing of Des Moines public school children is carried out in kindergarten and in the 9th and 12th grades. Each county school has its entire population tested every 4 years. Positive reactors in these groups have usually amounted to less than 6 percent for any age group.

2. Contact investigation: Each patient reported to have active tuberculosis is visited at home by a public health nurse, who applies tuberculin tests to members of the family and to others considered to be close contacts of the patient. The nurse arranges for chest X-rays of these individuals. She also makes a home visit whenever a miniature film report indicates a shadow suggestive of tuberculosis and advises the patient on the subsequent steps to be taken—a visit to the family physician or to one of the diagnostic clinics.

3. Prolonged followup of all persons known

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*Dr. Gelperin is director of the Des Moines and the Polk County Health Departments, and Dr. Galinsky is director of the tuberculosis division of the Broadlawn Polk County Hospital, Des Moines, Iowa. Mr. Iskrant is chief statistician of the Division of Special Health Services, Public Health Service.*

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to have had active tuberculosis: This is a regular function of the hospital's tuberculosis unit; for those patients who do not have legal residence in the county, the Christmas Seal clinic provides the service.

Of the 83 individuals with a diagnosis of active tuberculosis, only 7 (8.4 percent) were in the minimal stage, whereas 33 (39.8 percent) had moderately advanced tuberculosis, and 39 (47 percent) were considered far advanced. Four persons (4.8 percent) had extrapulmonary tuberculosis. Although a low discovery rate was anticipated in a low incidence area, the detection of only 7 minimal cases was of real concern.

Each patient diagnosed as tuberculous was visited by a specially trained public health nurse who was familiar with the objectives of the study. The nurse discussed with the patient and others close to him, and with the family physician and members of the hospital staff, the events related to the illness. The health department attempted to locate and review all previous X-ray films. Information was obtained concerning contacts and the results of their examinations.

A form was constructed to include this information, together with identification data; the motivation of the patient to seek medical care; a description of symptoms leading to diagnosis; place and date of diagnosis, stage and activity of the disease, and date of hospitalization; record of previous treatment for tubercu-

losis, including place, date, and outcome of treatment; and if previously reported as tuberculosis, date of report, county, or whether outside Iowa. If previous X-rays had been taken, the results and their interpretation were also entered on the form. Page 2 of the form provided space for data on contacts: name, age, and relationship to patient; tests for tuberculosis, with date and result of each test; miniature X-rays and 14" x 17" X-rays; diagnosis, whether previously known as having tuberculosis; and whether this tuberculosis activity was discovered by the present investigation.

### Reasons for Coming to Diagnosis

Most of the patients (52 of the 83) came to diagnosis because of symptoms. Thus, approximately 60 percent of all persons with active tuberculosis were diagnosed because of a sense of illness which prompted them to seek medical care either in the office of the family physicians or in a special clinic. Two of the group with minimal tuberculosis, 20 of the moderately advanced and 27 of the far-advanced groups, and 3 patients with extrapulmonary tuberculosis were so motivated. In 9 patients, the diagnosis was made as a result of an examination which included a routine chest X-ray. Four cases were discovered because the patients were examined as contacts. Routine screening of hospital admissions at the veterans facility in Des Moines resulted

**Table 1. Reasons for coming to diagnosis of 83 cases of tuberculosis diagnosed in Polk County, Iowa, 1952 and 1953**

Stage of disease	Total cases	Reason for coming to diagnosis							
		Symptoms	Physical examination including chest X-ray	Contact investigation	Routine X-ray of hospital patients or employees	Hospital admission X-ray	Mobile unit X-ray	Follow-up of previously known tuberculosis	Post-mortem examination
Pulmonary:									
Minimal.....	7	2	1	0	2	0	1	1	0
Moderately advanced.....	33	20	5	2	1	3	0	2	0
Far-advanced.....	39	27	2	2	0	0	2	3	3
Extrapulmonary.....	4	3	1	0	0	0	0	0	0
Total.....	83	52	9	4	3	3	3	6	3

**Table 2. Time interval from onset of symptoms or first suspicion of tuberculosis to definitive diagnosis**

Motivation and diagnosis	Time from suspicion of tuberculosis to diagnosis (months)								
	<3	3-6	7-9	10-12	13-24	25-36	>36	Unknown	Total
Motivation:									
Symptoms.....	22	4	3	3	10	2	5	3	52
Contact investigation.....	4	0	0	0	0	0	0	0	4
X-ray screening.....	6	1	1	1	0	0	0	0	9
Post-mortem examination.....	0	0	0	0	1	1	0	1	3
All other.....	9	1	1	1	0	0	0	3	15
Total.....	41	6	5	5	11	3	5	7	83
Diagnosis:									
Extrapulmonary disease.....	0	1	2	0	1	0	0	0	4
Pulmonary disease:									
Minimal.....	5	1	0	0	0	0	0	1	7
Moderately advanced.....	20	2	2	4	4	0	1	0	33
Far-advanced.....	15	3	2	1	6	3	4	5	39
Total.....	41	7	6	4	11	3	5	6	83

in the discovery of 3 residents of Polk County with tuberculosis; and X-ray examination of hospital staffs and patients hospitalized for other disorders revealed another 3 cases. The mobile X-ray unit screening service supplied the first evidence of disease in 3 patients; 6 were found through followup of previously known tuberculosis patients, and in 3, post-mortem examination supplied the diagnosis (table 1).

In this group of patients, 52 were men, 31 women. Approximately equal numbers of men and women made up the moderately advanced classification; but in the groups with minimal and far-advanced tuberculosis, there were more men than women. The median ages in relation to stage of disease were: minimal, about 30 years; moderately advanced, about 45 years; far-advanced, about 55 years. Among those who sought medical attention because of symptoms, there were slightly more women than men in the group with moderately advanced tuberculosis, whereas in the group with far-advanced tuberculosis there were almost four times as many men as women.

For patients who came to diagnosis because of symptoms, the elapsed time between onset of symptoms and diagnosis varied considerably. However, there was no essential difference in this time interval between men and women;

about the same proportion were diagnosed within 3 months. Of the 83 patients in the study, the largest number (22) were diagnosed within 3 months from the date symptoms of tuberculosis were first noticed (table 2).

Nevertheless, the median time between onset of symptoms and diagnosis is over 6 months, with 19 persons having a delay of more than 1 year. Persons coming to diagnosis for reasons other than symptoms were usually diagnosed within 3 months. Two persons in whom the diagnosis was established at post mortem had a duration of symptoms of more than 1 year.

It is of some interest that, according to these figures, the interval from first evidence of the disease to establishment of the diagnosis increased with advancing stages of the disease. All of the minimal cases with definable duration reached diagnosis within 6 months, as did two-thirds of the moderately advanced cases and a little more than half of the far-advanced cases. It required more than a year from the estimated date of onset to develop the diagnosis in 5 of 33 moderately advanced cases and in 13 of 34 far-advanced.

Of the 20 cases of moderately advanced tuberculosis coming to diagnosis because of symptoms of tuberculosis, 10 had been observed for possible tuberculosis for more than 6 months. Of 7 persons with positive screening X-rays,



**Table 3. Opportunities existing before definitive diagnosis in 52 patients with symptoms of tuberculosis**

Previous opportunities for suspecting tuberculosis	Stage of disease				
	Minimal	Moderately advanced	Far-advanced	Extrapulmonary	Total
Number of opportunities.....	0	14	18	2	34
Symptoms diagnosed as other disease.....	0	3	4	1	8
X-ray misread.....	0	4	1	0	5
X-ray positive <sup>1</sup> .....	0	3	4	0	7
Contact <sup>1</sup> .....	0	3	3	1	7
Previous tuberculosis <sup>1</sup> .....	0	0	6	0	6
Positive tuberculin test <sup>2</sup> .....	0	1	0	0	1
No opportunity.....	2	6	9	1	18
Total cases.....	2	20	27	3	52
Percent of total cases with previous opportunity for diagnosis.....	0	70	67	67	65

<sup>1</sup> Followup interrupted or not done.

<sup>2</sup> Followup interrupted.

only 3 had been suspected originally: 4 miniature films were reinterpreted as indicating possible tuberculosis.

Of 27 cases of far-advanced tuberculosis coming to diagnosis because of symptoms of tuberculosis, 16 had been suspected by the patient for more than 6 months, including 4 cases which had been for more than 3 years. Five persons had had previous miniature films, of which 4 had been read positive and 1 misinterpreted.

#### Missed Opportunities for Diagnosis

At least 12 persons had previous suspicion of tuberculosis which could have led to diagnosis. We reviewed the records for all cases in which symptoms motivated the person to seek diagnosis to determine if we could identify additional opportunities for diagnosis which had been missed. The findings are presented in table 3.

For minimal tuberculosis, we found no evidence that the disease could have been suspected earlier, but for moderately advanced, far-ad-

**Table 4. Results of contact investigation of cases of active tuberculosis diagnosed in Polk County, Iowa, 1952 and 1953**

Type and stage of tuberculosis	Number of source cases	Number of contacts <sup>1</sup>				
		Reported	Examined	Positive 14" x 17" X-ray	Active tuberculosis	
					New cases	Previously known cases
Pulmonary:						
Minimal.....	7	11	10	0	0	0
Moderately advanced.....	33	95	91	2	0	1
Far-advanced.....	39	135	124	7	2	0
Extrapulmonary.....	4	14	12	1	1	0
Total.....	83	255	237	10	3	1

<sup>1</sup> For purposes of this table a contact is defined as a case that could be located and does not include "source" cases, that is, persons who previously had reported the case as a contact.

vanced, and extrapulmonary disease, missed opportunities could be considered in two-thirds of the cases. Following is a recast of our interpretation of "missed opportunities."

1. "Symptoms otherwise diagnosed" included cases reporting to physicians with symptoms that might have been associated with tuberculosis as well as with the respiratory tract disease that was under treatment. The patients were ultimately diagnosed as active tuberculosis primarily because of the persistence of symptoms.

2. "X-ray misread" included cases in which rereading showed abnormalities which were "suspicious" of tuberculosis and which should have led to further followup.

3. "X-ray positive—followup interrupted or not done" included cases in which the "suspect" did not return for scheduled examination or in which for some other reason followup observation lapsed.

4. "Contact—followup interrupted or not done" included cases in which repeated examinations were not made frequently enough or in which investigation was not instituted.

5. "Previous tuberculosis" including "positive tuberculin test"—followup interrupted or not done. We feel that adequate patient education and followup should have led to a diagnosis of reactivation of disease before symptoms motivated the patients to seek medical care. In none of these cases was an X-ray performed within 3 years of the date of suspicion of active disease.

6. "None." This group includes patients found as a result of sudden hemoptysis, or with a history of vague, "unimportant" symptoms.

### Contact Investigation

We have previously noted that four of the active cases of tuberculosis are described as having come to diagnosis because of contact investigation (table 1). Table 4 presents the results of contact investigation of the 83 active cases of tuberculosis diagnosed during the period. The number of contacts named and examined approximated three per patient. Three previously unknown cases of active tuberculosis were found through the examination

of 237 contacts. Many of these contacts had not had the opportunity to have repeated examinations at the time this tabulation was prepared and further cases may be discovered in subsequent months. The relationships of the three active cases to the source cases were wife, husband, and mother.

### Discussion

In this group of patients, an average time lapse of about 3 to 6 months occurred between the onset of symptoms and the establishment of a diagnosis of tuberculosis.

Such a delay may be attributable partly to the patient himself, who may be slow to recognize the vague symptoms of fatigue, cough, and loss of weight as manifestations of tuberculosis. In this sense, the delay may, indeed, be implicit in the disease itself.

Conversely, the long interval between onset of symptoms and diagnosis may be a medical responsibility. However, the diagnosis of active pulmonary tuberculosis is not a simple decision and may be equally troublesome for the family physician and for the medical specialist. This is true when tuberculosis is the only disease to be considered. How much more perplexing is the problem when the disease occurs in the course of other long-term illnesses. In this respect, also, the stage of the tuberculosis is the primary factor in the delay of diagnosis.

To remedy the delay in diagnosis, we must advocate repeated careful searching examination of the patient, with the possibility of tuberculosis constantly in mind. And for the patient, we urge earlier visits to the physician as soon as he is aware of ill health.

Because of our low tuberculosis rate, we must also emphasize case-finding measures which reach the groups with the highest prevalence of tuberculosis. Additional community control measures that may be applied are the X-ray screening of certain groups, such as transients, welfare department clients, old-age assistance beneficiaries, and persons interned in prisons and jails. The members of families and other close contacts of patients can be examined at regular intervals. As school populations are tuberculin tested, families and close associates of reactors may be similarly treated.

Perhaps the only major mechanism lacking for more complete case finding is the establishment of a "suspect registry." This registry would include all individuals who react to the tuberculin skin test, and all those who have suspicious, though stable, X-ray findings. Such a proposal is based upon the assumption that anyone who has had a tuberculous infection has within him the potentiality for subsequent active disease. With reporting centralized in a health department, these individuals could be followed at regular intervals by an official

agency. They could also be impressed with the importance of disclosing their status to the physicians whom they may consult for other reasons. Operation of this plan over a number of years would develop a vast group to be held under observation. The plan is feasible only in a population with a low incidence of infection. Many small communities and some entire States present such a situation today, and it is in these areas that tuberculosis case-finding techniques could be augmented by the addition of a tuberculosis suspect registry.

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## *An Important Date*



Each month your health department and many hospitals, laboratories, schools, clinics, and homes receive a copy of **PUBLIC HEALTH REPORTS**, mailed to arrive on the 20th, or even earlier, depending upon geographic location of the subscriber.

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# Health Departments And Seafood Conservation

By A. L. CHAPMAN, M.D.

FOR at least 50 years health departments have worked assiduously to provide sanitary water supplies. They have cooperated with the Food and Drug Administration to make foods safer to eat. As a result of these efforts waterborne epidemics rarely occur and food poisoning outbreaks usually are self-limited and localized.

Health departments have recognized the fact that the quantity and the availability of water is as important to the health of the Nation as the bacterial and chemical quality of water. The time would now seem propitious for health departments to evince the same degree of interest in the quantity and the availability of food.

Some interesting facts bear on this problem. Only about one-third of the world's estimated population of 2,200,000,000 people are well fed. The rest are either starving or they are living on substandard diets.

One of the principal reasons for this wholesale and worldwide dietary inadequacy is the fact that only a small portion of the earth's surface can be cultivated. Four-fifths of the earth's surface is covered with water. The other one-fifth is above the sea. Less than 12 percent of this land area of 36,800,000,000 acres is capable of producing food. A large part of the 88 percent of land not under cultivation is barren and few of these billions of barren acres ever can be made economically productive.

## The Untapped Foodbasket

For many centuries the fertile elements of the soil have washed relentlessly down to the

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sea. Uncontrolled erosion caused a loss of top soil in which was mingled important nutritive elements. But the land's loss has been the ocean's gain. Even as the land became poorer, the oceans became richer. Nitrogenous substances and nutritionally valuable minerals leached from the soil became the fertilizer of the sea and supported luxuriant marine vegetation, generally food for the animal life of the sea.

Plankton pervade the ocean waters. They are to the sea what wheat and corn are to the land. They constitute the nutritional base of marine animal life. The waters of the earth contain billions of tons of planktonic materials that never have been harvested nor have they ever been used on any large scale to serve man's purpose.

By increasing the production and stimulating a higher consumption of fish and shellfish, at least indirectly we can tap that prolific foodbasket, which is the sea. The people of the United States are among the lowest per capita fish consumers in the world. This characteristic is not irreversible. Probably one of the best ways to reverse it would be to modernize shellfish production methods, more particularly the methods of oyster production.

## Oyster Production

In one eastern seaboard State where a laissez faire attitude toward oyster production long existed, the annual oyster production dropped from 15 million bushels in 1883 to its present level of slightly more than 2 million bushels.

This drop in production in the oyster catch in one State represents a protein loss equivalent to 130,000 Hereford cattle. If this State had instituted a leasing policy in 1900, it is estimated that the current annual oyster yield, instead of being in the neighborhood of 2 million bushels, would approximate 20 million bushels. In several adjoining States the drop in oyster production, since the latter part of the 19th century, has shown a similar steady downward trend.

The reasons for this continuing decline in oyster production are known to marine biolo-

gists and to enlightened oystermen. Unfortunately, the nutritional importance of oysters and other shellfish has not been publicized sufficiently nor well enough to motivate health agencies to give sturdy support to the handful of scientists and conservationists who unsuccessfully have been trying to reverse the downward trend in shellfish production for many years. Oyster production in the North Atlantic States has dropped to negligible proportions for many reasons. Among the more important reasons are uncontrolled harvesting, failure to adopt scientific methods of oyster culturing, and increasing amounts of water pollution.

The oyster is a nutritious article of diet. It compares favorably with milk, poultry, eggs, and meat in its content of essential amino acids. Oysters, like milk, contain an abundance of calcium. They are iodine rich. They are excellent sources of thiamin and riboflavin. Local health officers in coastline counties often comment on the fact that no pellagra or beriberi is found among the members of families who have a pile of oyster shells in front of their shacks. Some nutritionists rank oysters and claim in the category of milk as an exceptionally well-balanced food. And oysters are very

must be remembered, too, that steers must be fed and watered if they are to grow and fatten; oysters feed and water themselves.

An oysterman who cultivates an oyster farm in accordance with sound principles of farm management can make more money than a dirt farmer. The cultivation of a good acre of oysters can be 10 times as profitable as the cultivation of an acre of potatoes and 17 times as profitable as the cultivation of an acre of wheat.

### "Aquaculture"

In recent years, many dirt farmers, some 250,000 of them, have sensed the importance of fish and have constructed farm ponds in which fish are grown for food as well as for sport. The average yield of such ponds is about 200 pounds of fish per acre each year and well fertilized ponds can double that yield.

Congress recently recognized the importance of these ponds by providing special income tax exemptions for farmers who build them. It has been estimated that as many as 1,500,000 more ponds of this type could be wisely utilized.

In one of the coastal counties of a southern State, the maritime equivalent of a 4-H club



fish culture in Java, Indonesia. The Javanese started raising fish for food about 1,200 or 1,400 years ago. United Nations photograph from "The Story of FAO."

istence except in the memories of a few old-timers.

Enough scientific research has been done to permit the rehabilitation of these barren oyster beds if oystermen would take the advice of conservationists. Recent developments in the

science of "aquaculture" makes it possible to culture oysters in such a way that "seed" suppliers do not have to depend upon the hit-or-miss methods of the past.

By the scientific analysis of such growing factors as salinity, turbidity, currents, and tem-

perature, the areas best suited to growing seed oysters can be selected. The seed oysters can then be planted in other selected areas where they will grow more rapidly to maturity. By skillfully dividing oyster farming into two distinct stages, the growing of seed oysters in some areas and the maturing of them in other areas, oyster farmers no longer need depend entirely upon chance to obtain good yields.

Important recent experiments at several biological laboratories along the eastern seacoast have demonstrated that seed oysters, which grow prolifically in warm southern coastal waters, can be transplanted successfully to cooler waters further north. There they can grow normally to toothsome maturity freed from the marine jungle competition into which they are born.

### Health Department Interest

With many pressing public health problems on their way to solution, with human life expectancy approaching the 70-year mark, and with the world population steadily increasing, it is time to think much more seriously about the need to increase the world's and the Nation's

supply of food. The functions of health agencies are changing rapidly as the character of the health problems they face continue to change. In addition, then, to supervising the sanitary quality of water and food, would health departments be remiss if they became more actively interested in efforts that are being made to conserve and to expand the Nation's food supplies?

Can increased health educational efforts help popularize the wider use of fish and shellfish produced under sanitary conditions as dietary staples and thereby increase the demand for these products?

Can health departments help to increase the production of shellfish by encouraging marine conservationists to introduce more modern and more scientific methods of oyster culture?

Inevitably, the world's current population growth will generate the pressures needed to bring about an increase in our supplies of food.

Would it not be more in keeping with the leadership role of health departments to anticipate these pressures and attempt to moderate and perhaps guide them by participating actively in the rapidly developing though often lagging food conservation program?

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## PHS Staff Announcements

Assistant Surgeon General William H. Sebrell, Jr., director of the National Institutes of Health since 1950, retired on August 1, 1955, after 30 years of active duty as a commissioned officer of the Public Health Service. He has accepted appointment as research consultant for the American Cancer Society and will direct the society's research grants program.



Dr. Sebrell has earned worldwide recognition as a medical scientist, particularly through his studies on the B vitamins. In the 1920's, he was a member of the Public Health Service team that established the dietary origin, prevention, and treatment of pellagra. He discovered the causes and cure of ariboflavinosis and has made important contributions to research in the dietary causes and treatment of liver diseases, the effect of pantothenic acid deficiency on the adrenal glands, nutritional effects of sulfa drugs, and the cause and treatment of blood abnormalities.

Dr. James A. Shannon, formerly associate director of NIH, has succeeded Dr. Sebrell. Dr. Shannon is also chairman of the Public Health Service's Technical Committee on Poliomyelitis Vaccine. A commissioned officer of the Service since 1949, he was associate director in charge of research at the National Heart Institute prior to his becoming associate director of the Institutes in 1952. Dr. Shannon was awarded the Medal of Merit for his work in World War II malaria control programs.



Dr. Shannon received his medical degree from New York University in 1929. He also received a doctorate in philosophy from the same university in 1935. After teaching at the university, he became director of research at Goldwater Memorial Hospital in 1942. From 1946 to 1949 he was director of the Squibb Institute for Medical Research.

# A Positive Control For Coccidioidin Complement Fixation

By FREDERICK W. BIEBERDORF, Ph.D.,  
and KEITH WAYNE CHAMBLISS, Ph.D.

*The use of complement fixation tests for diagnosis of coccidioidomycosis by laboratories in "fringe" and "nonendemic" areas is limited by lack of human antiserum for positive control of the coccidioidin. Lyophilized rabbit antiserum is suggested for this purpose.*

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THE VALUE of the complement fixation test in suspected and proved cases of coccidioidomycosis has been adequately discussed by Smith and co-workers (1, 2). Conant and associates (3) have also pointed out the value of complement fixation tests as an indication of the status of a coccidioidal infection. Schubert and associates (4) reported the results of their investigation with histoplasmin.

The continuous research on the use of complement fixation in the diagnosis of mycotic diseases emphasizes the value of this test as a diagnostic aid. As this value is recognized, the clinical laboratories will receive more requests for complement fixation tests. The serologist may properly interpret the results of any complement fixation test only if a positive control serum is used in each test.

In the endemic areas for *Coccidioides immitis* outlined by Smith (5), the clinical laboratories probably have little difficulty in obtaining an

adequate supply of positive human serum. However, the clinical laboratories located elsewhere encounter considerable difficulty in obtaining or maintaining a supply of this control serum. These laboratories may receive only two or three requests for this complement fixation test each year. At present there appears to be no commercial source of a control serum for laboratories outside the endemic areas.

With this problem in view, a preliminary investigation was made to determine whether rabbit antiserum could be used to replace human antiserum as a source of positive control serum.

## Materials and Methods

Six young female white rabbits weighing from 5 to 7 pounds each were selected. Each of the rabbits was injected intraperitoneally with live spore mixtures of four strains of *Coccidioides immitis*. Ten days after this injection, 5 ml. of blood was removed from the ear of each rabbit, and the serum was tested for antibodies. Three of the rabbits showed high titer; all showed some titer.

As the rabbits were beginning to weaken from the intensity of the infection, they were bled approximately 50 ml. each by heart puncture on the 14th day after injection. The blood was permitted to clot, was centrifuged, and the serum separated. The serum of each rabbit was placed in a 50-ml. test tube and frozen until it could be tested. After each serum was again titered, the serums having similar titers were pooled and designated as serum pools 1 and 2. These two lots were dispensed in 10-ml. test tubes and refrozen until needed.

Autopsy of the rabbits revealed cysts, which were found to contain *C. immitis* endospores, in the peritoneal cavity.

Portions of the thawed serum pools 1 and 2 were dispensed into 2-ml. vials. The contents of the vials were frozen in a mixture of dry ice and isopropyl alcohol, desiccated, and sealed in vacuo. The vials of lyophilized serum were kept on the shelf at room temperature. When they were to be used, the serum solids

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of each vial were dissolved in 2 ml. (the original serum volume) of distilled water. The reconstituted rabbit serum was heated for 30 minutes in a 60° C. water bath just before use. The heated bath was used as described by Dr. John F. Kent, department of serology, Army Medical Service Graduate School, in a private communication. He has found that the bath is necessary to destroy the nonspecific anticomplementary activity in rabbit serum. Serial dilutions of the reconstituted serum were then prepared for the titrations.

Human serum from a case of disseminated coccidioidomycosis with a high titer (reported as 1:512 by the department of mycology) was used for comparative purposes. Portions of this serum were lyophilized along with the rabbit serum and sealed in vacuo. These serum solids were dissolved in distilled water, and this reconstituted serum was heated for 30 minutes in a 56° C. water bath just before use.

Serums from normal rabbits and normal human beings were used in the investigation as negative controls.

A coccidioidin antigen for use in these complement fixation tests was supplied by Dr. Charles E. Smith of the School of Public Health, University of California.

Crude antigen preparations were also made in the laboratories of Southwest Foundation for Research and Education from cultures of the same four strains of *C. immitis* used for injection of the animals in antibody production. These four strains had been isolated from active cases of coccidioidomycosis. They were grown on the asparagine synthetic medium used by Smith and associates (1) and by Schubert and co-workers (4) in their investigations. The cultures were incubated for 6 weeks at room temperature in Roux culture bottles.

The complement fixation procedures were adapted from procedures of Kent (6). Titrations of all reagents used in these procedures were carried out according to the procedures outlined in the Army Technical Manual (7). The complement solution used in these tests was twice as concentrated as designated in the manual, but only half the recommended volume was used. Thus the same number of units of complement were used; only the volume was changed.

In the complement fixation tests the materials were added to 10 by 75-mm. test tubes and mixed thoroughly after each addition. They were added in the following order:

1. 0.25-ml. antigen dilution.
2. 0.25-ml. serum dilution.
3. 0.25-ml. complement solution (containing 2 full units).
4. All tubes incubated at 4°-7° C. for 16 to 18 hours.
5. 0.50-ml. antishoop hemolysin (containing 2 units).
6. 0.50-ml. 2-percent sheep cell suspension.
7. All test tubes incubated for 30 minutes in 37° C. water bath.
8. All tubes were compared visually with synthetic standards freshly prepared in 10-percent hemolysis steps; hemolysis was estimated and recorded to the nearest 5 percent.

The titer of a serum was recorded as the highest dilution which would permit less than 70-percent hemolysis to be exhibited in this complement fixation test. A control tube containing all components except antigen was run with each serum dilution, and a control tube containing no serum dilution was run with each antigen dilution.

## Results

Preliminary titrations were performed to determine the optimum dilution for each antigen. Serial dilutions of the antigen, varying by a factor of 5, for example, 1:1, 1:5, 1:25, and 1:125, were prepared, and each of these dilutions was used for the titration of the antiserum.

The data obtained in the "crossmatch" titration of rabbit antiserum pool No. 1 with the coccidioidin furnished by Dr. Smith is shown in table 1.

The experiment showed a serum titer of 1:64 when a 1:25 dilution of this coccidioidin was used. This 1:25 dilution of Dr. Smith's antigen was used later in the titrations of rabbit antiserum. The crude antigens prepared in this laboratory also showed maximum activity at a 1:25 dilution with rabbit serum pool No. 1 if the antigens showed any activity. In contrast to these results, Dr. Smith's coccidioidin showed a maximum activity at a 1:5 dilution when used for the titration of a positive human serum in a "crossmatch" procedure identical to that outlined in table 1.

Identical titrations were performed on samples of rabbit antiserum pools Nos. 1 and 2

**Table 1. "Crosshatch" titration of Smith coccidioidin and rabbit serum pool No. 1, tabulated in percent hemolysis**

Antigen dilution	Serum dilution				Saline control
	1:8	1:16	1:32	1:64	
1:1.....	5	15	ac	—	—
1:5.....	0	0	25	—	—
1:25.....	0	0	5	50	—
1:125.....	5	15	20	95	—
Saline.....	—	—	—	—	—

NOTE: Dash (—)=100 percent hemolysis; ac=almost complete hemolysis (greater than 95 but less than 100 percent).

which had been stored in the frozen state, and samples which had been lyophilized. The results of these titrations are shown in table 2, along with results obtained when a lyophilized

sample of pool No. 1 was titrated 6 months later. Table 3 shows the results of a similar titration of the one human antiserum available. The drop in titer from 1:256 to 1:16 on lyophilization could not be confirmed by repeating the experiment because no more of the human antiserum was available.

## Discussion

There appears to be little difficulty in producing antiserum to *C. immitis* in rabbits. Although some rabbits develop a higher titer than others, standard immunological techniques can be used to follow the progress of the immunity reaction, enabling the worker to choose the animals showing the highest titers as a source of antiserum. As has been observed in other antiserum production, lyophilization destroys little if any of the antibody content. The lyophilized

**Table 2. Titration of rabbit serum; antigen: 1:25 dilution of Smith coccidioidin, tabulated in percent hemolysis**

Pool No.	Lyophilized	Serum dilution								Saline control	Titer
		1:1	1:2	1:4	1:8	1:16	1:32	1:64	1:128	1:256	
1.....	No.....	0	0	0	0	0	35	—	—	—	1:32
1.....	Yes.....	0	0	0	0	0	0	45	—	—	1:64
2.....	No.....	0	0	0	20	55	95	—	—	—	1:16
2.....	Yes.....	0	0	0	40	80	—	—	—	—	1:8
1.....	Yes <sup>1</sup> .....	0	0	0	0	0	0	55	—	—	1:64
Normal rabbit serum.....		—	—	—	—	—	—	—	—	—	( <sup>2</sup> )

<sup>1</sup> Stored for 6 months.

<sup>2</sup> Negative.

NOTE: Dash (—)=100 percent hemolysis.

**Table 3. Titration of positive human serum; antigen: 1:5 dilution of Smith coccidioidin, tabulated in percent hemolysis**

Lyophilized	Serum dilution								Saline control	Titer
	1:1	1:2	1:4	1:8	1:16	1:32	1:64	1:128	1:256	
No.....	0	0	0	0	0	0	10	10	65	1:256
Yes.....	0	0	0	0	15	75	ac	—	—	1:16
Normal human serum.....		—	—	—	—	—	—	—	—	( <sup>1</sup> )

<sup>1</sup> Negative.

NOTE: Dash (—)=100 percent hemolysis; ac=almost complete hemolysis (greater than 95 but less than 100 percent).

products appear to be stable indefinitely at room temperature, which would permit shipment to, and storage by, small laboratories until needed.

The sharp drop in titer in the one human antiserum after lyophilization is not what would be expected. No conclusions should be drawn until additional human antisera are available for testing.

Further investigations must be carried out before a lyophilized rabbit anticoccidioidin is placed on the market as a standard reagent. The most important question to be answered is the one concerning the specificity of the antibodies produced by rabbits and humans. It is possible that the rabbit antibodies titrated in the above experiments were specific for one kind of molecules in the coccidioidin, the carbohydrates, for example, while the human antibodies were specific for an entirely different kind of molecules, possibly proteins, but not carbohydrates. Admittedly this example is an oversimplification. Nevertheless, some indirect evidence makes the possibility worthy of investigation. Martin (8) has shown that an alcohol-precipitated carbohydrate-like substance from *Blastomyces dermatitidis* antigenized guinea pig complement with rabbit antiserum but not with human antiserum although the protein portion of the *B. dermatitidis* cells did fix complement with the same human antiserum. Hassid and co-workers (9) have also shown that carbohydrate materials from coccidioidin failed to fix complement with human antiserum. The same human antiserum did fix complement with the original coccidioidin.

Of primary importance would be the comparison of the complement-fixing abilities of various purified fractions of coccidioidin with rabbit antiserum and with human antiserum. Additional investigations need to be accomplished; this is contemplated as soon as funds are available for this purpose. With such additional data, it appears possible lyophilized rabbit serum may become available to laboratories commercially.

### Summary

Young female rabbits weighing 5 to 7 pounds were injected intraperitoneally with live spore

mixtures of *Coccidioides immitis*. Fourteen days following the injection the rabbits had developed a high titer of antiserum specific for *C. immitis*. This antiserum, when lyophilized and sealed in vacuo, was shown to be stable indefinitely at room temperature.

It is suggested that, after further investigation, such an antiserum preparation might be used as a positive control serum of known titer by laboratories which have no available source of supply of fresh positive human antiserum for *C. immitis*.

Problems which remain to be investigated are discussed.

### REFERENCES

- (1) Smith, C. E., Saito, R. R., Kepp, R. McE., Clark, R. W., and Eddie, B. U.: Serological tests in the diagnosis and prognosis of coccidioidomycosis. *Am. J. Hyg.* 52: 1-21, July 1950.
- (2) Smith, C. E., Whiting, G., Baker, E. E., Rosenberger, H. G., Beard, R. R., and Saito, M. T.: The use of coccidioidin. *Am. Rev. Tuberc.* 57: 330-360, April 1948.
- (3) Connut, N. F., Smith, D. T., Baker, R. D., Callaway, J. L., and Martin, D. S.: *Manual of Clinical Mycology*. Ed. 2. Philadelphia, W. B. Saunders, 1951, pp. 113.
- (4) Schubert, J., Ajello, L., Sanford, S., and Grant, V. Q.: Variation in complement fixation antigen production by different strains of *Histoplasma capsulatum* grown on two media. *J. Lab. & Clin. Med.* 41: 91-97, January 1953.
- (5) Smith, C. E.: Diagnosis of pulmonary coccidioidal infections. *California Med.* 75: 385-391, December 1951.
- (6) Kent, J. F.: The application of quantitative methods in studies of the antigen-antibody reactions. A thesis. Durham, N. C., Duke University, 1950.
- (7) U. S. Department of the Army: Methods for medical laboratory technicians. *Army Tech. Manual S-227, AFM 160-14*. Washington, D. C., U. S. Government Printing Office, 1951, pp. 562-566.
- (8) Martin, D. S.: Serologic studies on North American blastomycosis. Studies with soluble antigens from untreated and sonic-treated yeast-phase cells of *Blastomyces dermatitidis*. *J. Immunol.* 71: 192-201, September 1953.
- (9) Hassid, W. Z., Baker, E. E., and McCready, R. M.: An immunologically active polysaccharide produced by *Coccidioides immitis* Rixford and Gilchrist. *J. Biol. Chem.* 149: 303-311, August 1943.

## 1955 National Health Forum

**A**IR POLLUTION, mental health, chronic diseases, radiation, home accidents, and personnel shortages emerged at the 1955 National Health Forum, New York, March 23-25, as targets for the immediate future.

From the opening address by Ellsworth Bunker, president, American National Red Cross, to the 35th annual meeting of the National Health Council, the audience faced a series of challenges to the public health profession. Focusing on one of the challenges, Dr. Daniel Bergsma, State health commissioner for New Jersey, noted that although his State has been alert to the need for developing public protection against radiation, the swift pace of nuclear events finds current programs behind impending needs.

Mr. Bunker pointed out that, as the focus of health and welfare programs has shifted from relief of the sick and underprivileged to the improvement of the community as a whole, the need has grown to pool resources in comprehensive programs. He urged that volunteers support recruitment and training of health personnel; that they support education for improvement of mental health; that they cooperate in reducing the burden of handicapped or delinquent children; that they share in the immediate establishment of health plans for coping with national disasters; and that they encourage their neighbors to establish State and local health councils. Through such working partnerships, he said, "We can set an example of what can be done by free men to improve the welfare of the human race. This spontaneous association of men of good will can create a bridge of understanding among the nations which would overpass political antagonisms."

The probable changes in the economy, as a

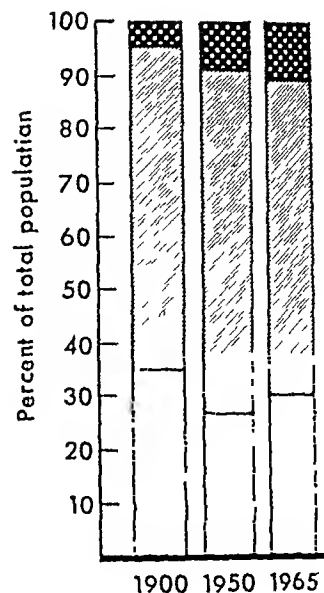
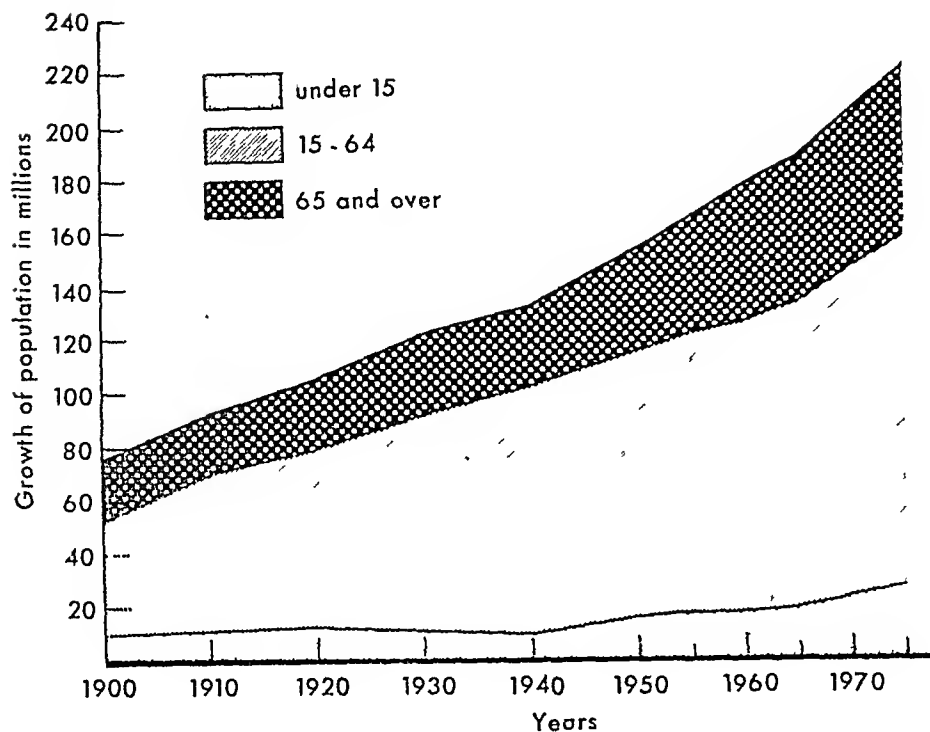
basis for planning future health programs, were described by Dr. Dexter Merriam Keezer, vice president of the McGraw-Hill Publishing Co., with the specific provision that he assumed that his neat trend lines would not be disheveled by nuclear weapons. He also entered a reservation posed at an earlier date by Aristotle: "It is part of probability that the improbable happens."

By 1965, he forecast an American population of 190 million, an increase of 26 million above the present level, a number nearly twice the present population of Canada.

He pointed out that the population is not merely aging: It is growing more at the ends than in the middle. He forecast by 1965 an increase of 25 percent in the age group above 65. They would then be 9 percent of the total, as against 4 percent in 1900. The increase for children under 15 was forecast at 17 percent, as against 13 percent in the working-age group. But he predicted that rising productivity would permit the working-age population to carry the increasing burden of children and retired elders without strain. He also predicted a slight further gain in the minute excess of females over males. For this reason, he also forecast an increase in the number of women working in industry, with possible ill effects on female life expectancy.

He said the trend to move from farms, to urban or suburban areas would continue, with further aggravation of the problem of developing community health facilities in fringe areas.

Automation of many clerical jobs, he felt, would pose special mental problems for white-collar workers who place high value on the "continuity and stability of what they do." As a sample of things to come, he cited a data processing machine which with 10 man-hours does



This chart is based on the chart included in "Some Economic Factors in Forecasting the Nation's Health," the paper presented by Dr. Dieter Merriam Keezer at the National Health Forum, March 23, 1955.

work which formerly required 1,800 man-hours. The maintenance man for this machine requires a degree in physics.

On the whole, he foresaw great material gains in earnings and possessions, equivalent to an additional \$400 per person per year in present purchasing power. Moreover, he felt that these material gains would be shared broadly by most of the population.

Dr. Otis Anderson, chief of the Bureau of State Services, Public Health Service, questioned whether, without a marked change in public policy, there would be enough health personnel and facilities to permit the economy to expand as Dr. Keezer predicted. Without adequate health services, he suggested that productivity would suffer, and the incapacity of the older members of the family population would indeed be a burden on those of working age. He advocated as a measure to offset the rise in chronic diseases a medical form of DDT: Detection, Diagnosis, and Treatment. Facilities for care and treatment of older people, he emphasized, did not necessarily imply complete nursing care or elaborate hospital facil-

ities. A private home, properly designed and located, or household help would in many instances suffice. As to patterns of population movement, he asserted that tax structures, as broadly based as those of the typical health department, would be necessary to meet the rising demands for rural and suburban health services.

In view of the trend toward a broader distribution of income, Dr. Anderson cited figures demonstrating how protection against hospital, surgical, and medical expense has been extended to millions in the population. Most of this extension, he said, has come about since 1945, largely through collective bargaining between labor unions and management.

Dr. William A. Sawyer, consultant to the International Association of Machinists, emphasized that demands for health services are growing more rapidly than population. This is not a simple need for medical care, he said, but a need for better public health methods, a better distribution of health centers, and effective staff. The crucial question, he said, is not what economic trends will do to health

services but what health conditions will do to the economy. To emphasize this point, he reported that in West Virginia, 376 families on relief were rehabilitated at less than the \$225,000 spent annually on their maintenance, with the result that they now earn more than \$500,000 a year.

The rise in population, suggested Dr. James Perkins, managing director of the National Tuberculosis Association, might produce crowded housing conditions which would reverse the declining trend of tuberculosis. He expressed concern also with the prospect of population movements and growth in areas, certain western States and migrant labor camps,

which do not now provide adequate health services. The increased leisure predicted by Dr. Keezer would not, he said, necessarily improve mental health if we lack plans for utilizing such leisure. He stressed the point that spiritual leaders of all cultures have held that healthy minds and emotions are far more to be desired than material possessions.

At luncheon, delegates heard leaders in the field of communications discuss fundamentals of using magazines, newspapers, and broadcasting for effective health education and information.

Regulation of fluorides in public water supplies is a responsibility of the entire community, not that alone of the dentists, physicians, or,

Gains and losses to the medical profession

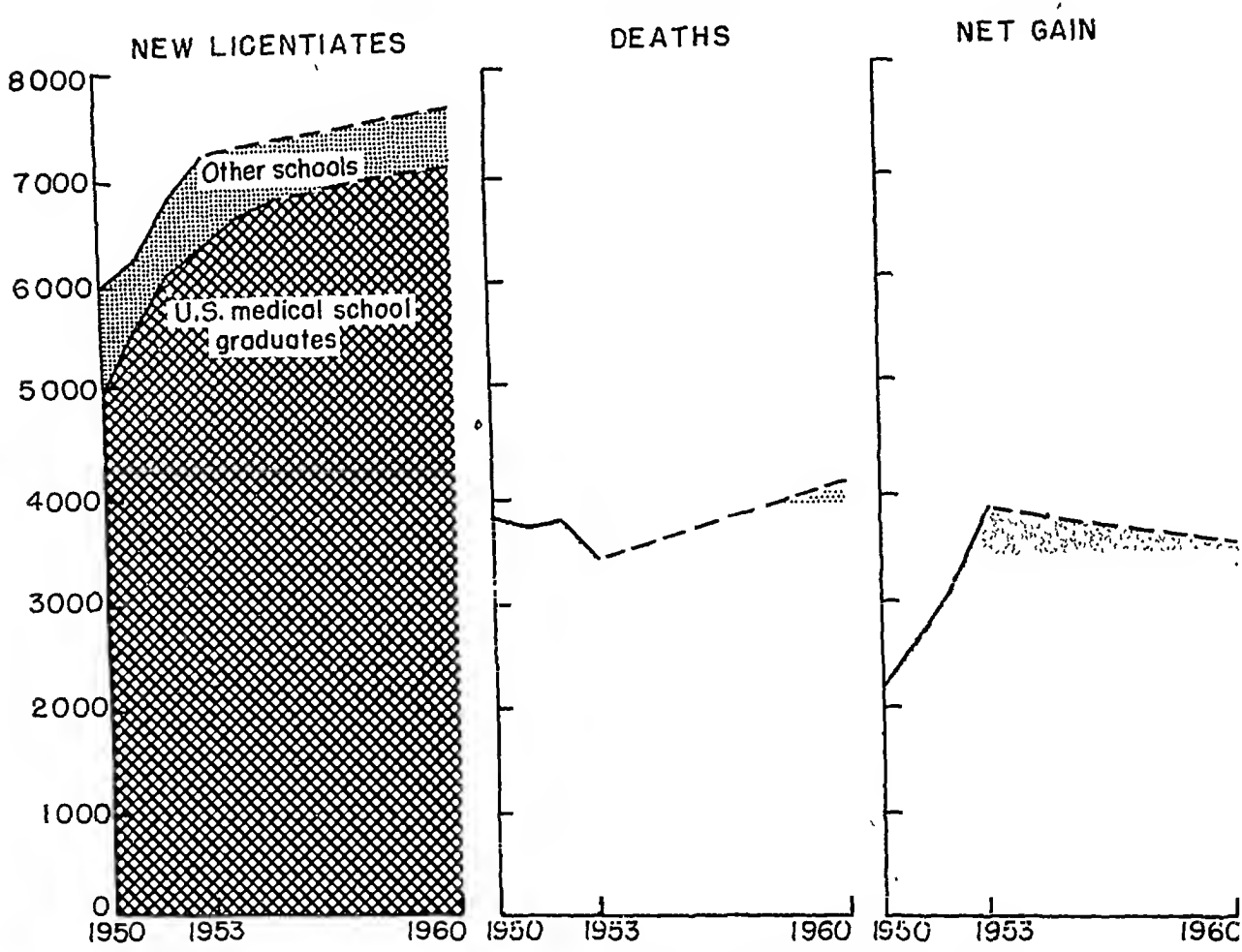


Chart prepared by the Division of Public Health Methods, Public Health Service.

If present trends continue, the net gain to the medical profession is expected to be about 3,500 in 1960. Deaths among physicians will probably rise to 4,100 in that year. Licentiate representing additions to the profession will be about 7,600. Of these, 7,100 will be graduates of approved medical schools in the United States.

the health workers, and the chief function of the health profession is to make facts available, according to a panel which included two members of the American Dental Association, Dr. J. Roy Doty, secretary of the Council on Dental Therapeutics, and Herbert B. Bain, director of the association's Bureau of Public Information. Also participating was Al Schottelkotte, reporter-columnist for the *Cincinnati Enquirer*, whose home city of Cincinnati rejected fluoridation by a referendum in 1953.

Dr. Bergsma's paper and excerpts from other addresses at the conference follow below.

In other action at the National Health Council meeting, Dr. Hugh R. Leavell, dean of the Harvard University School of Public Health, was installed as president, and Dr. Leona Baumgartner, health commissioner of New York City, was chosen president-elect.

The forum also heard a discussion of prospects for care of the long-term patient, analysis of the recommendations of the Hoover Commission on Organization of the Executive Branch of the Government, and comments on the recruitment of career workers in public health.

## Radiological Health Services in New Jersey

The increasing use of more potent radiation sources, including radioactive isotopes, in this Nation and in the State of New Jersey, has already presented problems to those charged with responsibility for the preventive and constructive phases of public health administration.

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*Daniel Bergsma, M.D., M.P.H., commissioner, New Jersey State Department of Health, presented this paper at the 1955 National Health Forum of the National Health Council in New York City on March 23, 1955. Other papers from the forum follow in brief form.*

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Under the caption of "radiological health," there has developed a series of activities, unique in concept, with which official health agencies have begun to concern themselves.

Beginning in 1946, the Atomic Energy Commission permitted the distribution of an entirely new family of reactor-produced radioactive materials to authorized users for any purpose deemed by the Commission to be in the public interest. Contingent upon the sale of radioisotopes has been a series of requirements for radiological protection designed to safeguard individual and public health. We have tended to accept without comment this approach by the Atomic Energy Commission to the distribution of potentially hazardous materials. However, be assured that this is a remarkably modern concept and practice. This was possible because the Atomic Energy Commission was a governmental agency and was authorized by law so to do.

Major manufacturers of dangerous and toxic materials may label their products and indicate precautionary measures to be taken in handling the hazardous substances, but they could not take steps to reassure themselves that the precautions were being carried out.

If the control features used by the Atomic Energy Commission had been applied from the outset of the use of radiation, dating back almost 60 years, there would not now be the same uneasiness which exists in the minds of thinking individuals with respect to effects of radiation on public health.

The Atomic Energy Act of 1954, for the first time, opened the door for the development of the competitive use of private atomic energy within the United States. We can anticipate, I believe, that in a relatively short period, many of us will find in our respective jurisdictions, new users of nuclear energy.

The presence of nuclear power as a competitive process in the national scene has been stifled, in a sense, by the extreme caution necessary to provide adequate radiological health safeguards. This problem is very real. If we are to encourage the optimal growth of this awe-inspiring source of energy and simultaneously fulfill to the utmost our primary responsibilities as overseers of the environ-

mental well-being of the Nation, we must be capable of presenting a sympathetic but firm understanding of the problems generated by this expanding activity.

Many of us had our first introduction to atomic power by way of civil defense activities. The terms "radiation monitoring," "fission products," "radiocontamination," and so forth, have become increasingly familiar to us. The single exposure, lethal dose of 450 roentgens of whole body radiation became axiomatic. It took considerable reorientation in our radiological training to meet the first peaceful uses of atomic energy: radioiodine-131 and radiophosphorus-32 in clinical medicine, cobalt-60 in industrial radiography and cancer therapy, and strontium-90 in beta-thickness gauges. We have had to develop different concepts of instrumentation and shielding designed for a maximum permissible exposure level of 300 milliroentgens per week for industrial workers.

I certainly cannot advise on how to acquire these capabilities rapidly and yet in a practical manner. However, I can describe what has been done in the New Jersey State Department of Health to develop authority and competence.

It has been demonstrated that public health engineers, industrial hygienists, and public health physicians and nurses, already well versed in the intricacies of developing sound occupational health programs, are able to adapt themselves to this new science. There should be no hesitation in the future in asking that each such staff member prepare himself to understand and apply radiological health principles. The public health administration of these principles is no different from that of any other official health responsibility.

### **The New Jersey Program**

Our experience in New Jersey suggests that certain factors are essential to the development and success of a radiological health program:

First is training for field and office personnel.

Second is supportive legislation in order to define the scope of authority to recommend radiological health controls wherever necessary. This legal base was brought about in New Jersey by the Public Health Council of the State of New Jersey exercising its existing power

with the adoption, effective December 15, 1952, of chapter VI, on radiation, as part of the State sanitary code.

This chapter is as follows:

"Regulation 1—Application of chapter.

"(A) X-ray machines and all other sources of radiation shall be shielded, transported, handled, used, and kept in such manner as to prevent all users thereof and all persons within effective range thereof from being exposed to excessive dosage of radiation. Owners or users of sources of radiation shall not expose themselves or permit others within effective range to be exposed contrary to regulations which may be promulgated by the State Department of Health relative to sources of radiation.

"(B) Every incident of exposure to radiation in violation of the aforementioned regulations or of this Chapter shall be considered a separate offense."

The simplicity and brevity of this chapter and its wide latitude for interpretation and enforcement make it a powerful instrument for radiological health control. Easily adopted departmental regulations that are amended readily, relating only to those sources of radiological health hazard demanding immediate attention, may be promulgated while the broader powers of the department in the entire field of radiological health remain unaffected.

To date the only departmental regulations which have been issued are those relating to fluoroscopic shoe-fitting machines.

Third is the preparation of a concise declaration outlining proposed activities in the field of radiological health. This is stated in New Jersey's radiological health program, formally approved on May 19, 1954. The findings of our earliest exploratory field activities were utilized to develop a realistic program.

Fourth is the ability to impart authoritative radiological health information and specialized advice to all interested parties.

### **Facing Up to the Problems**

Now we must be prepared to operate in the realm of tomorrow and face the problems associated with nuclear power reactors, the most concentrated energy source thus far devised for peaceful purposes and, at the same time, poten-



has been a slowly evolving understanding of what we like to think are the fundamentals of radioactivity.

It was soon recognized that the radiations of radium were capable of killing living cells and that slowly developing degenerative changes of tissues exposed to these radiations could occur. The radiations of radium were applied to medical purposes and to a certain extent utilized in industry. The extraction of radium from its parent ore, pitchblende, was a laborious and costly process. The production was quoted in terms of milligrams, and a gram of radium with a radiation value which we now call a curie, cost about \$70,000. Over the years the stock of separated radium supply grew until finally about 1 kilogram had been separated.

Small as this total stock seems to be, the studies made of radium and other naturally radioactive elements led to the very fundamental knowledge on which our modern concepts of radiation protection are based. Furthermore there developed the technique of supplementing X-ray therapy with local implantations of radium and radon which have been of so much value in the treatment of many forms of cancer.

Significant as were these developments, the rate of progress was greatly increased by the development of accelerators of energy sufficient to induce nuclear reactions. The production of radioactive isotopes unknown in nature became possible for the first time, and these in turn were the keys that opened the doors to new knowledge in biochemistry and physiology. The fundamental studies of the physicists in turn led to the further great wartime accomplishments of the Manhattan Engineer District and the development of our present atomic energy program.

We now have in our hands modalities of research which only a few years ago were merely the ephemeral substance of dreams. Already there has occurred a tremendous revolution not only in the technology of biological and medical research but indeed in the concepts of the nature of material substance and the character of life itself. From that which already has transpired and has come into the field of human experience and knowledge, one may make certain predictions with reasonable confidence in

their reliability. We must never forget, however, that we merely stand on the threshold of a new era of knowledge. Phenomena and concepts, of which today we do not even speculate, surely lie in the future. With these qualifications and reservations arising from the sense of our intellectual limitations, I wish to discuss a number of specific topics.

## Medicine

We are in the early period of great advances in biochemistry. These will surely have profound impact not only upon our knowledge of disease but also upon the methods of diagnosis. Reactions which may be brought about in the various physical states make it possible to introduce radioactive atoms as tracers into the most complex and delicate molecules. One can visualize that the diagnostic approach of the physician of the next 25 to 50 years will revolve around the quantitative measurement of the behavior of specific enzyme systems. The laborious and crude chemical techniques of today will be replaced by precise and rapid procedures of far more discriminating character through the introduction of radioactive atoms into highly specialized compounds of physiological importance. In our future medical schools, the teaching will of necessity emphasize the dynamic characteristics of intracellular reactions which can be observed in the living state without injury to the individual.

We may anticipate that within the next 50 years epidemics from infectious agents will have ceased to be a major threat to life and health. With the possibilities that are at present foreseeable we may anticipate that the scourges of parasitism of both animals and man that retard the development of tropical peoples will have been overcome.

This changing prospect with respect to infectious disease means that we must concentrate more and more attention on the understanding of the mechanisms of physiological deterioration with age and the specific diseases of the later decades. We may anticipate that through the combined efforts of the chemist and the radiologist we will be able to release powerful radiations within pathological cells to achieve either a cure or satisfactory sup-

pression of cells which have undergone neoplastic change.

While we may anticipate great improvement in the processing of atomic fuels, the same principles extend directly into such areas as the production of synthetic foodstuffs and the utilization of solar energy through the process of photosynthesis. Inherent are the prospects of new and greatly improved drugs for medical purposes and the production of compounds necessary to nutrition.

## Public Health

It seems obvious that we are already in the midst of a profound change in the character of our public health problems. While the established concepts of epidemiology still hold, we see progressively greater preoccupation with substances which, in contrast to the living infectious agents, are not capable of multiplication but are capable of spontaneous transformation or transmutation. In the instant of release of radioactivity, the atom changes from one element to another which in some cases is capable of still further radioactive change. There is a consequent change in the behavior of the material in the chemical sense. It is a phenomenon remotely comparable to the sudden appearance of a mutation in a living cell line.

As the utilization of atomic energy for industrial and scientific purposes multiplies, as inevitably it will, the responsibility for insuring that the environment occupied by people, and by the biological systems upon which human life depends, shall not be contaminated to a level of population hazard. In general, this is equivalent to saying that the environmental contamination must be maintained at levels considerably below those considered significant as hazards to individuals.

The essentials of protection from dangerously radioactive substances are: time, distance, shielding, and containment. All radioactive substances decay and in time result in ordinary stable elements. The times required vary from minute fractions of a second to many years. The longest half-life of a fission product of any biological significance is approximately 20 years, although smaller amounts of elements of less biological consequence are formed that have

half-lives as long as 33 years. Consequently, inherent in considerations of environmental radioactive contamination is the element of time.

From the standpoint of external exposure to radiation, distance is extremely important as a protective measure. Intensity falls off as the square of the distance from the source, and to this there is a further reduction from attenuation by the air. A source which may be dangerous close up may be quite innocuous at a moderate distance.

All radiations may be stopped by appropriate and adequate shielding. The character of the material used for shielding and the amount of it are partly determined by the nature and intensity of the radiation concerned.

Containment is the fourth essential factor in radiation protection. Materials which would be hazardous if released to the environment in quantity may be held in storage until radioactive decay has taken place and the levels of radiation reached are acceptable in the disposal area. At Hanford large quantities of highly radioactive fission products are held in underground tanks for many years. Materials which might be hazardous are thus kept confined and do not enter the environment where they could be a risk to life.

As with all toxic substances, there are levels of exposure to radiation and various radioactive elements internally which can be said to be safe in the sense that no significant injury may be detected over the lifetime of the individual. These permissible or tolerance levels are determined through careful study of all available information derived from human experience and animal experimentation. In the United States the National Committee on Radiation Protection considers these matters and advises on the levels which may be accepted as permissible. Their recommendations are published from time to time by the United States National Bureau of Standards.

These developments mean that the sanitary engineer and the public health worker, not only now but especially in the years to come, must give increasing thought to the control of radioactive substances in the environment and the manner in which such substances may enter the various life cycles that constitute our food

chains. It requires diligence and a redirection of public health education.

That it is perfectly feasible to live and work with vast amounts of highly radioactive substances has already been demonstrated in the plants of the AEC itself. In some of these plants, the workers manipulate safely radioactive material equivalent to thousands of tons of radium. Not only has radiation injury been almost negligible in the atomic energy industry but the climate of radiological safety has resulted in better care with respect to hazards of all kinds so that the safety record of the AEC has merited special recognition. Difficult as the problems are, there is no occasion for fear that this record cannot be continued in the expanding atomic energy industry which may form one of the bases of our industrial and social structures within a comparatively few decades.

## Manpower Potentials

**PHR** Many ways are being developed to overcome the economic barriers to good care which have existed in the past. While the quality and availability of health services is rapidly expanding, however, the population of the United States is growing.

Dynamic forces will increase the demand for health workers in the years ahead.

There are unmet demands today in medical education, public health, mental and tuberculosis hospitals, and rehabilitation. Many rural

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areas and small towns are in need of practicing physicians. Hospitals in increasing numbers are resorting to the use of alien physicians with training which is less than adequate by our standards for house staff service. A civilian disaster of the magnitude possible today could put an incredible load on the available physicians.

It is often said that areas with lower physician population ratios are not economically in a position to utilize a greater number. However, the fact that in States with the poorest ratios, doctors report the longest workweek averaging 63 hours a week, and the highest average incomes, indicates that the demand for services in many of those areas is placing a heavy strain on the supply.

In dentistry, a parallel problem exists. Training facilities are being expanded. But this increase is not quite keeping up with the population, and by 1965 the ratio of dentists to population will be, we estimate, 57 per 100,000 as compared with 58 per 100,000 today.

The number of graduates of schools of nursing has been stabilized at 28,000 or 29,000 since 1951, but the number of entrants is now rising again.

The shorter patient stays and the emphasis in rehabilitation on getting the patient on his feet and returning him rapidly to a condition of independence all call for new emphasis in nursing care and have resulted in an intensification of nursing activities.

Efforts of the nursing profession to maintain the supply of professional workers and to improve their utilization have been outstanding, and there is indication that the supply situation in nursing is not as critical as it was a few years ago.

One aspect of better utilization is the increased employment of other workers for functions which do not require the nurse's special skills. The trend toward hospital staff nursing and away from private duty nursing means that more nurses are available for hospital employment.

The training of paramedical workers such as physical therapists and occupational therapists is likewise increasing although the numbers of these are still very small. But present levels

of training are not at all closing the gap between demand and supply.

For each of these professions there are probably over 3,000 vacant positions today.

The demand in these areas is continuing to grow rapidly, and though the supply of graduates is increasing there is every indication that the demand will continue to outrun the supply.

### For the Future

This is the time then to take a long look at the educational opportunities which we are prepared to offer, both as to quality and quantity. First, curriculum: Most of the health professions today are looking seriously at their curriculum and weighing it in relation to the total job to be done. They are looking, although perhaps still not sharply enough, at the problem of training the workers in the many disciplines to work together for the patient, to orient their planning and activities so that the best thing is done for the patient rather than the best thing for the individual category of professional worker.

A real bottleneck in education today is salary scales. This is part of a general problem which plagues the Nation, that of obtaining enough teachers and good enough teachers from the kindergarten through the whole educational process.

Getting adequate facilities is another serious hurdle in providing for professional education. Schools of medicine and dentistry and nursing are seriously hampered by lack of facilities. Schools of the paramedical professions also suffer seriously from lack of basic clinical facilities and equipment.

Thus far, however, the attacks on these problems of curriculum, of faculty, and of facilities have been piecemeal and inadequate.


A basic across-the-board necessity is money. Medical schools, dental schools, schools of nursing, and the paramedical sciences are all hampered by lack of adequate funds in carrying out the objectives of their present programs, in recruiting and maintaining staff, in developing programs to meet changing needs, and in providing the best educational environment.

The spirit of rehabilitation is in itself a spirit

of dedication to the human welfare and dignity of man, regardless of his physical limitations.

In forecasting America's health, our efforts and the degree of success we achieve in developing improved health for the peoples of the world are a major factor. In our shrinking world of today, our own health—medically, emotionally, economically, and politically—is dependent upon the health of the rest of the world. To achieve that state of health, we could do well to adopt the slogan of an obscure but wise English philosopher who said 300 years ago, "If every man would but mend a man, the world would all be mended."

## March of Medical Science

 The title of this program, "The March of Medical and Social Sciences," in itself reflects growing awareness that health is an inseparable element in social progress and that medical science does not and cannot function in isolation from the social, economic, educational, and cultural forces in our society.

### Research Advances

The problems faced by medical science are tremendous in volume, scope, and complexity. When one looks back at what medical science has accomplished over a span of several decades, he can identify the items quite easily. When one looks at medical science today and tries to pick out the most promising work, he finds the task quite difficult. But when one attempts to anticipate what progress will have been made by, say 1975, his first inclination is to look for

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*By C. J. Van Slyke, M.D., associate director, National Institutes of Health, Public Health Service, Bethesda, Md.*

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cover, and his second is to generalize and digress, because the record shows that medical progress is replete with false hopes, pitfalls, and hypotheses that cannot be confirmed. The way to progress is long and difficult, and the specific advances are anticipated only by those who possess temerity and clairvoyance.

It is possible, however, to pick out several broad general areas and to project recent progress for several years, assuming that no new variables are brought into play. I will try to confine my speculations to areas which might have meaning in terms of planning health resources for the future.

It is reasonable to assume that there will be vaccines which will be largely effective in the prevention of influenza, poliomyelitis, and the minor upper respiratory infections, including the common cold.

There could be major advances against heart disease, featuring the prevention of rheumatic heart disease by the prevention of rheumatic fever; drugs to control hypertension; and some as yet unknown means to control the fatty deposits in the blood stream which lead to atherosclerosis.

There will be improvements in cancer diagnosis. Treatment of cancer will improve, too; in addition to X-ray therapy and surgery, there may well be chemical agents of particular value against the soft tumors.

There will be new drugs useful in the management of mental illness. We shall have better knowledge of prevention. But the hard core of the problem of mental illness will remain until training and education begin to yield the professional staffs that are so desperately needed, both to study mental illness and to care for the mentally ill.

There will be a series of new drugs, both natural and synthetic, useful in the treatment of arthritis and other rheumatic diseases.

We shall have the knowledge and methods to prevent several of the leading forms of blindness, particularly among children.

There may be fewer advances in the management of neurological disorders, such as cerebral palsy and muscular dystrophy. However, new rehabilitation techniques are in process which bring some of the victims of these diseases a measure of independent self-care.

## The Medical Science Spectrum

As one studies the pattern of research activities in the medical and biological sciences, it becomes apparent that while a great deal of progress is being made toward relief or amelioration of the effects of disease, we are not making the same progress toward understanding of the basic underlying causes of disease. This is particularly true for the chronic illnesses. I raise this point only to emphasize the continuing need for fundamental studies, as distinct from target-applied research, which will yield the knowledge with which we can achieve the ultimate goal—prevention.

By these fundamental studies, I refer, in part, to clinical and laboratory investigations, but I also refer to those studies involving man in his environment, both normal and abnormal. If medical science applies the knowledge and techniques of epidemiology, statistics, economics, sociology, anthropology, and related fields to these fundamental investigations, it may find that such fields have as much potential for identifying the factors in disease causation as the clinical and laboratory studies.

Medical science has concentrated on understanding the nature and modes of action and interaction of progressively smaller things. Not too many decades ago, we were studying functions of whole organs or large sections of tissue. Gradually, we reduce the dimension of our studies to the cellular level. Now we are concerned with subcellular matters. We find that even within the cell, there are relations and interdependencies which materially affect the life processes. Scientists study, for example, the role of cytoplasm in genetics, the ability of viruses to destroy certain cells but live peacefully in others, or the factors that govern cell growth and multiplication.

I do not, of course, challenge the validity of the scientific method which seeks understanding of the processes of health and disease through this microscopic and submicroscopic approach. I stress, rather, that it is time for us to also give emphasis to the study of man as a "supramacroscopic" organism, if you will, and to study the whole man in relation to other men and to the environment in which they live.

By way of illustration, we are now conducting a study of a neurological disease known as amyotrophic lateral sclerosis, more commonly called "Lou Gehrig's disease." On the island of Guam, this disease is 50 times more prevalent than it is in the United States. That offers a golden opportunity for an epidemiological study. There is another study in Massachusetts, which has undertaken to follow a large population group in order to investigate and evaluate the factors involved in the development of hypertension and atherosclerosis. The investigators are not only physicians but also epidemiologists, biostatisticians, social workers, nurses, public health workers, industrial physicians, sociologists and psychologists, anthropologists, and historians—all those who can contribute to better understanding of what causes contribute to having or not having heart disease.

### **No Formula for Progress**

Progress in medical science does not come easily. But I am convinced that it will continue in the future as it has in the past, and perhaps more abundantly. We have only to build intelligently on our experience.

The most serious threat to the ability of medical science to do the job it must do is the impending shortage of trained investigators of all kinds. Science teaching in the secondary schools has not kept pace with increasing needs. The preclinical sciences have suffered in the colleges and universities. And there are too few career opportunities in the basic sciences related to medicine and biology. We must do something immediately and constructively to resolve this issue.

### **Cooperative Effort**

Another challenge of medical science is to achieve a more effective linking of institutions and agencies and organizations which together make up the health resources of our Nation.

I do not mean to oversell the value of coordination as such. There are times when I feel we spend so much time coordinating our efforts that the efforts themselves get almost obliterated, and coordination becomes merely entanglement. Cooperation, yes—knowledge of other

programs, ability to use them as resources, eagerness to work together where interests merge, respect for the objectives and methods of other groups, desire to avoid jurisdictional disputes—these are the essence of effective cooperation in health and related fields. For example, one city has a single telephone number to answer all health inquiries in order to assure appropriate referral to the proper health agency or agencies.

We need more of this kind of cooperation. For as we get larger and older as a Nation, the health needs of the people grow and the pattern of health services changes to meet these needs.

### **The General Outlook**

Probably the largest single factor to concern those who plan civilian health programs in this country is our changing population.

Heart disease, cancer, mental and neurological disorders, arthritis and various metabolic problems such as diabetes, blindness, and dental disease will reach even greater proportions. The future will bring increased pressures upon society to prevent or cure these chronic diseases, to prolong the usefulness of man throughout the maximum portion of his allotted years.

The emphasis on chronic diseases should not obscure the fact that serious infectious diseases are with us, too—hepatitis, influenza, brucellosis—and that any relaxation of public health vigilance is an invitation for reappearance of smallpox, typhoid fever, and other scourges of the past. This work becomes all the more meaningful when one remembers that certain major chronic diseases may well have their origin in micro-organisms. Witness, for example, the several types of cancer in animals which are known to be caused by viruses.

Another problem for the future rests on the fact that this country has become predominantly urban. This trend increases the burden of State and local health departments to maintain sanitary, healthful conditions for our 160 millions. It brings to the fore such programs as city health planning, air and water pollution, accident prevention, sanitation, and cancer that may be of industrial origin.

I think I should make special mention of two problems of major significance: mental illness

and diseases of aging. Already the mentally ill occupy half of America's hospital beds and cost us well over a billion dollars in tax money alone. And the dimension of the problem is growing by \$100 million a year. We must certainly find better preventive methods and more practical and adequate means of treating these unfortunates.

Related problems are juvenile delinquency, drug and alcohol addiction, the gamut of self-injurious and antisocial behavior, to be approached through both the physical and the social sciences.

So we return to my earlier reference on the inseparability of medical and social science. It is all too obvious that we must do something about effective utilization of our older people, reexamining our whole social and economic structure to find ways to help them recapture their place as useful and productive and happy members of society.

### Conclusion

In conclusion, this judgment seems germane to the forward march of medical science:

We must move simultaneously toward better application of what we now know about the prevention and control of disease; toward the acquisition of new knowledge; and toward making the necessary changes in today's health structure to be ready for tomorrow's challenges.

## Social Processes at Work



Public health workers have two major interests: acquiring new health knowledge and applying known techniques and information. In different words, public health is committed to research and to practice. Social science can

aid in both. Examples from psychosomatic medicine, child study, and nutrition will indicate how social science can assist in basic health research.

### Health Research

In the field of psychosomatic medicine, social scientists are exploring areas of social strain as possible determinants of ailments such as ulcers. Social mobility is one of the cardinal features of America's open class system. Striving for mobility may bring tangible benefits, but it also generates anxiety, and it is possible to study the role of mobility anxiety in ulcer formation. In recent decades ulcer has increasingly become a man's rather than a woman's disease. This may be related to men's steady loss of social status and security as a result of the ascending social position of women.

Social science is slowly building up information about, and fashioning tools for, studying personality formation. This is an important part of the field of child development, a field in which the health disciplines and the social science disciplines alike have a lively interest. Recently, for instance, Cornell, Harvard, and Yale have begun a joint study of parent-child relationships in five different villages located respectively in India, Okinawa, the Philippines, Mexico, and New England. Using nature's cross-cultural laboratory, this farflung research project is designed to test certain hypotheses concerning child training and its impact on child behavior, adult personality, and cultural values.

Still another example relates to nutritional research. Epidemiological studies and laboratory work have focused attention on the possibly critical role of certain vitamins, amino acids, and antibiotics in promoting normal growth. To test out some of these findings in the field, a nutritional research organization in Central America set up a series of experiments in five local villages. School children in each community were given a different combination of nutrients and food supplements. Periodically the nutritional status of the children was checked through blood sampling and other means. But in one of the vil-

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*By Benjamin D. Paul, Ph.D., lecturer on social anthropology, Harvard University.*

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lages the parents threatened to withdraw their children from the program, jeopardizing the conclusiveness of the ultimate research results.

To locate the sources of resistance, an anthropologist was sent into the community. These are some of the things he found out. Project personnel had unwittingly become identified with one of two hostile political factions; this led to the charge that the program was dangerously subversive. A local medical clinic and other services, intended to win village good will and cooperation, were causing more harm than good; they were not adjusted to local expectations. According to their lights, parents saw blood sampling as injurious to their children's health; they regarded blood as a non-regenerative substance. Moreover, they began to spread and credit rumors that the object of feeding children was to fatten them for export to the United States where they would be eaten; they now believed that the purpose of blood taking was to check scientifically whether the children were ready for shipment.

Once the sources of trouble were located, the anthropologist was able to suggest counter-measures to regain the villagers' confidence and allow the research program to run its full course. Here again, social science techniques furthered the cause of health research. However, social scientists are able to contribute even more perhaps to public health practice than to public health research.

### **Public Health Practice**

The practice of public health emphasizes promotive and preventive medicine. Even more distinctively it is concerned with groups, populations, and communities, rather than with individuals in relative isolation. Social scientists by definition are equally concerned with groups and communities, although their primary urge is to acquire knowledge rather than put their knowledge to practical use; by inclination they prefer scholarship to a career of service. Yet their interest in understanding the community attracts them to action programs. By observing how communities respond to service programs they learn how communities work. Health programs in turn can improve their ap-

proach by taking advantage of the information the social scientists thus accumulate.

In working with health teams, social scientists probably cannot make their best contributions by engaging in direct service; their training doesn't usually fit them for social work. They can help in program planning, but perhaps their greatest contribution can be made in program assessment.

### **Assessment of Effect**

Suppose a health agency is dedicated to changing a community's health habits. After a period of effort the agency wants to know: Did any change occur? Was the change the one we wanted? Were we the cause of the change?

Social scientists have techniques for supplying the answers. By means of interviews or questionnaires and using proper sampling methods, the health habits of a community are measured before and after the campaign.

In several Syrian villages it was found, for example, that hygienic habits had improved appreciably after 2 years of organized effort. Conceivably the improvement might have come about despite the health campaign and not because of it. Indeed control villages showed similar improvement during the same interval, thus making it difficult for the health workers to claim the credit for the change in their experimental village. We don't really know what happened. The answer would require use of a yardstick that measures process rather than effect alone.

Recently an interdisciplinary team engaged in an intensive campaign to alter attitudes toward the mentally ill in a fairly prosperous domestic community. Team members reasoned that an unfavorable attitude toward discharged mental patients was influencing the high rate of relapse and readmission to overcrowded hospitals. They established themselves in the town, gained the cooperation of influential persons, and used, as means and resources, motion pictures, pamphlets, books placed in the library, newspaper notices, broadcasts, speakers, small group discussions.

Before and after the campaign they collected several hundred questionnaires designed to re-



veal attitudes toward the mentally ill—conceptions of cause, curability, degree of personal responsibility for helping a sick relative, willingness to associate with a person discharged from a mental hospital. They twice administered the same set of tests in another town where no campaign of health education was attempted. As expected, the people there showed no significant change of attitude. But surprisingly, neither did those where the intensive campaign had been tried.

The reasons for this negative outcome were instructive. But to understand the reasons they had to investigate process rather than rest content with measuring effect.

### Assessment of Process

In the mental health instance, the processes responsible for the negative outcome could be uncovered by combining various types of evidence, including data from intensive interviews and observed changes in people's reaction to the education and testing team.

One of the ideas the team had sought to communicate was that no sharp line divided the sane from the insane, that personality types fell along a continuum running from the fully nor-

mal to the fully abnormal, and that most released hospital patients were therefore not essentially different from other people and should be treated accordingly.

But people in the community clung hard to their black-and-white concept of normality and abnormality. Not always certain about their own sanity, they had erected a wall of defense that sharply divided the sane from the insane. In trying to undermine this popular conception, the educators were apparently arousing deep insecurities. Without good rational defenses against rational argument, the citizens responded by withdrawing their cooperation. They showed outward apathy, attempted to withdraw, and ultimately expressed open hostility toward the project personnel.

The lesson is clear. Before trying to change old health habits and ideas for new, it is wise to ascertain what the established habits and ideas are and what psychological and social functions these beliefs and practices perform. It is in this direction that social scientists can point the way. Ultimately their biggest contribution to health programs may lie in probing beneath cases of success and failure to unravel the hidden processes that are ever at work in the community.

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## Marshall A. Shaffer, 1899–1955

Marshall A. Shaffer, chief of the Technical Services Branch, Division of Hospital Facilities, Public Health Service, died suddenly on May 25. Mr. Shaffer, internationally recognized for his work, was responsible for the architectural engineering phases of the hospital survey and construction program since its inception. He entered the Public Health Service in 1941 and was commissioned as engineer officer in 1945.

After graduation from Pennsylvania State College in 1922, Mr. Shaffer worked for 11 years as an engineer in Central America, Mexico, and the southwestern United States. During this time



he studied and practiced architecture. He worked on the design of the Los Angeles General Hospital, the largest in the world, and won several competition awards. In 1933 he became consulting designer for the Federal Works Agency.

In 1951, Marshall Shaffer was given the American Institute of Architecture's Kemper award for "ensuring the conduct of the hospital building program in harmony with the highest ethical standards." That same year he was invited to represent the United States at the Building Research Congress in London. In 1952, he was a delegate to the Eighth Pan-American Congress of Architecture at Mexico City. At that time, he was elected president of the Plenary Session on Hospitals, the first American to be so honored.

# The Internal Revenue Code of 1954 and Health Programs

By SELMA MUSHKIN, M.A.

OF SPECIAL INTEREST to public health personnel are changes in the new Internal Revenue Code of 1954 providing additional tax relief for those who become ill and incur large medical bills. Also of interest are provisions affecting health manpower, training, and research.

The new revenue code was designed primarily to remove inequities, clarify tax law, and bring the provisions of the taxing statutes in line with current economic developments. Although the new tax act involved a tax reduction of \$1.4 billion, it was designed as a reform and not a tax reduction measure.

## Sick Leave Pay and Medical Costs

Two provisions of the Internal Revenue Code of 1954 are especially notable for their potential impact on health programs and voluntary health insurance. These provisions relate to sick leave pay or temporary disability benefits and the tax deduction allowed for medical expenses.

### *Employer Sickness Benefit Plans*

In the last decade employer participation in employee health and welfare plans has expanded considerably. A combination of fac-

tors has stimulated employer interest in health plans. Increased recognition of such plans as an integral part of the labor-management programs, union emphasis on this form of protection in collective bargaining, the exemption of these plan benefits from restrictions of the wage stabilization program, and the indirect incentive of the excess profits tax have all contributed to this growth.

It has been estimated that employer contributions toward pension, health, and welfare plans reached \$5 billion in 1953 (1) and that employer contributions for health insurance plans alone exceeded \$750 million (2).

Considerable uncertainty developed under the earlier revenue laws concerning the tax liability of employer contributions toward sickness and health insurance of their employees. For some time before the enactment of the code of 1954, changes in Internal Revenue Service regulations were under discussion to clarify the employees' tax liability for these health and sickness insurance premiums. The new code specifies that premiums and contributions paid by employers under a plan to finance sickness and accident benefits are not currently taxed as employee income. Furthermore, employer payments and premiums to reimburse an employee for expenses incurred for the medical care of the employee, his spouse, and dependents are tax exempt, provided the employee does not claim a medical expense deduction for such expenses under his individual income tax.

Uncertainty also developed concerning the

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taxability of sickness benefits received by employees under plans operated by their employers (3). In general, amounts received as accident or cash sickness benefits were excluded from gross income under the earlier statutes and regulations, if the benefits were paid under an insurance contract. Benefits financed by an employer under a self-insured plan or a wage continuation plan were taxable. In the words of the Ways and Means Committee of the House of Representatives: "Very troublesome legal and administrative problems have arisen in determining whether particular plans, especially self-insured plans, which are financed by employers without the use of a carrier or insurance company, constitute insurance for purposes of the exemption" (4).

Although employer sickness benefit plans (including sick leave provisions for government employees) go back many years, provision of cash sickness benefits was stimulated considerably by the enactment of State temporary disability benefit laws, the Federal railroad cash sickness benefit provisions, and by collective bargaining agreements. Rhode Island adopted the first State temporary disability program in 1942. California, New Jersey, and New York also have enacted temporary disability statutes. In these three States, unlike Rhode Island, the benefits may be paid either from a State fund or under a private plan which conforms with State law. An approved private plan in these three States may be set up either in the form of a contract with an insurance carrier or on a self-insurance basis satisfactory to the States (5).

In 1953, cash sickness benefits under State law totaled \$231.8 million. Of this total some \$140 million was paid out through private plans, including about 8-10 percent which was paid out under self-insured plans. It has been estimated, furthermore, that in 1953 approximately \$975 million was paid in premiums for private insurance against loss of income during sickness, and the benefits paid out under this insurance amounted to about 60 percent of the premiums, or \$600 million (6). While there are no adequate current data on employer participation in the payment of these premiums, it has been estimated that employers are financing about 45 percent of the premiums paid.

In general, the new revenue code narrows the exemptions of these sickness benefits from taxable income by imposing a limitation on the maximum amount of sickness payments financed by employers which may be excluded from income. In testifying on the new revenue code, for example, Marion B. Folsom, Under Secretary of the Treasury, stated: "When the present law was put into effect giving tax exemption status to sick benefit payments under insured plans, very few insurance companies would write policies providing more than \$50 or \$75 a week benefits. But, in recent years they have cut off the maximum and now some of these insured plans provide almost unlimited benefits when people are out sick, for executives, as well as the rank and file. Under the present law, that is all tax exempt. Under our proposal, we would put a ceiling of \$100 a week on tax exemptions of any sick benefit plan" (7).

The new code clearly excludes from gross income the benefits an employee receives under a workmen's compensation act for sickness or accident incurred in the course of employment. It also excludes compensation paid under a workmen's compensation act to the survivors of a deceased employee. Similarly, damages received on account of personal injury or sickness (whether by suit or agreement) are clearly excluded. Full exemption is also granted for payments received for the permanent loss or loss of use of a member or function of the body or the permanent disfigurement of the employee, his spouse, or dependent provided such payments are not a continuation of wages for the period an employee is absent from work (8).

Payments received by an employee under an accident or cash sickness plan for wage loss resulting from illness or injury are exempt up to a weekly rate of \$100. However, such payments received during the first 7 days of illness are exempted from taxation only if the employee is hospitalized for at least one day during the period of illness. When the absence is caused by injury or accident there is no waiting period.

The exclusion from income, while narrowed for those receiving benefits under plans carried by insurance companies, is broadened to include payments under a self-insured plan and

amounts received as wages or in lieu of wages during a period of sickness. These payments, previously taxable, are now exempt within the \$100 weekly maximum to the extent they are employer financed. In general, the provisions of the new code follow the practices of many commercial insurance policies in length of waiting periods, in differentiating between hospitalized illnesses and other illnesses, and in distinguishing between accidental and other disabilities. The new tax provisions add another incentive to hospitalization and raise many complex problems similar to those involved in the administration of sickness benefit payments.

A notice of proposed regulations under the accident and sickness benefit provisions of the new code was released in the Federal Register on March 24, 1955. These regulations set forth rules for determining the amount of benefits attributable to employer contributions in cases in which contributory and noncontributory plans are combined. They clarify the basis of differentiating payments which are related to a period of work absence from other disability benefits. The regulations also spell out the rules for determining the proportion of wages which may be excluded under wage continuation plans, by defining both the basis for determining the weekly rate of pay and the period during which income attributable to illness may be excluded.

If the amount of wages or benefits received does not exceed \$100 a week, the full amount of the payment after the waiting period may be excluded from gross income without regard to the number of additional days of absence from work. If the wages exceed \$100 a week, the payment during the period of illness is prorated in proportion to the \$100 weekly maximum. For example, an employee earns \$120 a week. He is ill for the waiting period and an additional 3 days. He receives a total of \$192 during the period of illness. The \$120 pay for the first week would be counted as income. Sixty dollars of the additional \$72 in wages received for the 3 days of additional absence would be excluded from the employee's gross income. In other words, the exclusion would be in the ratio that the \$100 maximum is to the weekly wage of \$120.

Among the various problems of definition and interpretation in the new tax provisions is that of the definition of illness. The Internal Revenue Service under a recent ruling, for example, has determined that "payments received for a period of absence due solely to pregnancy may not be excluded from gross income. Pay for time missed for actual sickness during a pregnancy whether or not a result of the pregnancy, however, would be an exempt income amount."

It may be of interest to note that a provision of the new revenue code is especially addressed to the problem of equalizing the tax treatment of retirement pay on account of service-connected disabilities of the commissioned officers of the Public Health Service and of the Coast and Geodetic Survey with those of members of the armed services. For all these groups such payments are exempted from taxable income.

### *Medical Expense Deductions*

A deduction for medical care expenses in excess of 5 percent of income was first introduced in 1942 along with the wartime increases in individual income taxes and reductions in personal exemptions. The Senate Finance Committee, in approving the deduction in that year, reported that "This allowance is recommended in consideration of the heavy tax burden that must be borne by individuals during the existing emergency and of the desirability of maintaining the present high level of public health and morale" (9). The deduction was modified by subsequent revenue acts. In 1944, the lower limit was changed from 5 percent of net income to 5 percent of adjusted gross income, that is, income before exemptions and allowed nonbusiness deductions. Other revenue acts raised the maximum amount of the deduction. A significant change was made by the Revenue Act of 1951 which permitted taxpayers 65 years of age and over to deduct medical expenses for themselves and their spouses without regard to the 5 percent of income minimum.

The new code makes three major changes in the medical care expense deduction. It allows deduction of medical expenses in excess of 3 percent instead of 5 percent of adjusted gross income. It limits the amount of drugs and medicine which may be included in medical care

**Table 1. Number of taxable income tax returns with medical and dental deductions and amount of such deductions, 1950**

Adjusted gross income classes	Number of tax returns (thousands)	Adjusted gross income reported (millions)	Medical and dental deductions (millions)	Medical and dental deductions plus 5 percent of adjusted gross income		
				Amount (millions)	Percent of adjusted gross income	Average amount per return
Total.....	4, 138	\$17, 766	\$1, 260	\$2, 148	12. 1	\$519
Under \$1,000.....	40	36	4	6	16. 7	150
\$1,000-\$1,999.....	416	664	75	108	16. 3	260
\$2,000-\$2,999.....	818	2, 068	191	294	14. 2	359
\$3,000-\$3,999.....	1, 113	3, 890	295	489	12. 6	439
\$4,000-\$4,999.....	798	3, 551	236	414	11. 7	519
\$5,000-\$6,999.....	656	3, 786	233	422	11. 1	643
\$7,000-\$9,999.....	170	1, 372	97	166	12. 1	976
\$10,000-\$14,999.....	70	835	57	99	11. 9	1, 414
\$15,000-\$24,999.....	37	697	41	76	10. 9	2, 054
\$25,000-\$49,999.....	16	517	24	51	9. 3	3, 188
\$50,000-\$99,999.....	3	222	6	17	7. 7	5, 667
\$100,000 and over.....	1	97	1	6	6. 2	6, 000

SOURCE: Data from the Internal Revenue Service.

expenses to sums in excess of 1 percent of income.

For example, a family with an adjusted gross income of \$5,000 may deduct medical expenses above \$150 instead of the amount in excess of \$250 previously allowed. However, this family can include in the deduction only the amount above \$50 that they paid for drugs and medicine. The maximum allowable deduction for medical expenses is increased from \$1,250 to \$2,500 per exemption. The overall limit per tax return for a married couple filing a joint return or a head of a household has been increased from \$5,000 to \$10,000. For a single person filing a return or married persons filing separately the maximum limit is raised from \$2,500 to \$5,000.

Other changes in the medical care deductions are also made by the new code. A new provision allows the expenses of a last illness to be deducted on the final return of a decedent, even if the expenses are paid after death. The definition of medical expenses is clarified by providing for the deduction of amounts paid for accident or health insurance and transportation expenses for travel prescribed for health reasons. Expenses for food and lodging during such travel are not deductible.

The Department of the Treasury at the time

of the hearings on the new revenue act estimated that about 8.5 million taxpayers would receive additional tax relief as a consequence of the changes in the medical care deductions and that the net cost to the Government in the form of tax loss would be about \$80 million.

In assessing the importance of the change in the medical care deduction provision, it is important to take account of the population represented on tax returns and the extent to which even large medical care bills fall within the limits of the so-called standard deduction option provided for all taxpayers (10, 11). An estimated 55 to 60 million tax returns were filed for the 1954 income year—80-85 percent estimated as taxable. The population represented on taxable returns has been estimated at between 65 and 70 percent of the total population. Those not taxable include, among others, persons drawing on their capital and assets for current living expenses, those with income less than \$600 per person supported by the family head, and those receiving a large portion of their income from nontaxable sources such as public payments and contributory annuities.

Even among the taxpaying group, however, a standard deduction is used far more frequently than are itemized deductions. The standard deduction, written into tax laws to

simplify administration, authorizes an average amount of deduction for all taxpayers for the deductible items of expenses—such as charitable contributions, property taxes, interest on indebtedness, and medical expenses. The standard deduction amounts to 10 percent of adjusted gross income, up to \$1,000 (\$500 for spouses filing separate returns). Accordingly, those with no deductions other than medical care costs—even costs amounting to as much as 15 percent of income—would tend, because of the greater simplicity, to use a standard deduction. Despite this fact, in 1950, the last year for which complete tabulated data are available, some 4 million taxpayers itemized their medical care deductions. In the aggregate, medical expenses of these taxpayers exceeded \$2 billion, or over \$500 per tax return. The amount of medical and dental deductions totaled \$1.3 billion (table 1). Almost half of the approximately 8.5 million taxpayers who itemized their deductions, instead of claiming a standard deduction, reported medical expenses in excess of 5 percent of income (table 2). The variation in the amount of average medical care expenses per return by income group and the percent of income spent for medical care are shown in tables 1 and 2. Table 3 indicates the proportion of total returns whether taxable or not

which reported medical and dental deductions for that year and the amount of these deductions by income groups.

The data derived in the operation of the revenue act may be compared with data available on the distribution of medical care costs for all families in the population. The Health Information Foundation, for example, in its recent study of voluntary health insurance and consumer expenditures for personal health services in the period 1952-53, found that 7 percent of all families—approximately 3.5 million—incurred medical care expenses in excess of \$495. Approximately 1 million families incurred medical care expenses equalling or exceeding one-half of their annual incomes, and about 500,000 families incurred medical expenses equalling or exceeding their annual income (12).

The national bill for medical care expenses in 1953 was approximately \$10 billion, or about 4 percent of personal income after taxes. The total by class of service as estimated by the Social Security Administration is shown in table 4.

During the course of the hearings on the change in the medical care expense deductions much testimony was offered on the need for special tax provision to give taxpayers incen-

**Table 2. Taxable returns with itemized deductions, all types of deductions and deductions for medical and dental expense, 1950**

Adjusted income	Taxable returns with itemized deductions		Returns with medical expense deduction		
	Number (thousands)	Percent all taxable returns	Number (thousands)	Percent all taxable returns	Percent itemized taxable returns
Total.....	8, 724	22. 85	4, 138	10. 84	47. 43
Under \$1,000.....	77	4. 90	40	2. 55	51. 95
\$1,000-\$1,999.....	710	11. 84	416	6. 94	58. 59
\$2,000-\$2,999.....	1, 443	16. 55	818	9. 38	56. 69
\$3,000-\$3,999.....	2, 082	24. 02	1, 113	12. 84	53. 46
\$4,000-\$4,999.....	1, 653	28. 80	798	13. 90	48. 28
\$5,000-\$6,999.....	1, 556	34. 21	656	14. 42	42. 16
\$7,000-\$9,999.....	488	31. 16	170	10. 86	34. 84
\$10,000-\$14,999.....	257	37. 85	70	10. 31	27. 24
\$15,000-\$24,999.....	220	55. 56	37	9. 34	16. 82
\$25,000-\$49,999.....	163	74. 09	16	7. 27	9. 82
\$50,000-\$99,999.....	56	88. 89	3	4. 76	5. 36
\$100,000 and over.....	19	95. 00	1	5. 00	5. 26

SOURCE: Data from the Internal Revenue Service.

**Table 3. Number and percent of income tax returns with medical and dental deductions, and amount of such deductions compared with adjusted gross income, by income class, 1950**

Adjusted gross income classes <sup>1</sup>	Number of individual tax returns			Returns with medical and dental deductions <sup>2</sup>		
	Total (thousands)	With medical and dental deductions		Adjusted gross income reported on returns with medical deductions (millions)	Medical and dental deductions	
		Number (thousands)	Percent of total <sup>3</sup>		Amount <sup>4</sup> (millions)	Percent of adjusted gross income <sup>4</sup>
Total .....	53, 060	4, 859	9. 2	<sup>5</sup> \$19, 397	\$1, 560	8. 0
No adjusted gross income .....	404	8	1. 9	<sup>6</sup> 32	4	12. 8
Under \$1,000 .....	7, 362	122	1. 7	98	27	27. 6
\$1,000-\$1,999 .....	10, 550	612	6. 1	1, 006	159	15. 8
\$2,000-\$2,999 .....	11, 429	1, 040	9. 1	2, 613	280	10. 7
\$3,000-\$3,999 .....	9, 837	1, 238	12. 6	4, 319	353	8. 2
\$4,000-\$4,999 .....	5, 985	857	14. 3	3, 834	278	7. 3
\$5,000-\$6,999 .....	4, 519	656	14. 4	3, 786	233	6. 2
\$7,000-\$9,999 .....	1, 566	170	10. 8	1, 372	97	7. 1
\$10,000-\$14,999 .....	679	69	10. 2	835	57	6. 8
\$15,000-\$24,999 .....	396	37	9. 4	697	41	5. 8
\$25,000-\$49,999 .....	220	16	7. 5	517	24	4. 3
\$50,000-\$99,999 .....	63	3	5. 4	223	6	2. 8
\$100,000 and over .....	20	1	3. 1	97	1	1. 4

<sup>1</sup> Adjusted gross income means gross income minus allowable trade and business deductions, expenses of travel and lodging in connection with employment, reimbursed expenses in connection with employment, deductions attributable to rents and royalties, certain deductions of life tenants and income beneficiaries of property held in trust, and allowable losses from sales or exchanges of property. Should these allowable deductions exceed the gross income, there is an adjusted gross deficit. The adjusted gross income classes are based on the amount of adjusted gross income, except that returns with adjusted gross deficit are designated "no adjusted gross income" without regard to the amount.

<sup>2</sup> Medical and dental expenses, reported on returns with itemized deductions, paid for the care of the taxpayer, his spouse, or dependents, not compensated by insurance or otherwise, which exceed 5 percent of the adjusted gross income. The deduction in 1950 could not exceed \$1,250 multiplied by the number of exemptions other than those for age and blindness with a maximum deduction of \$2,500, except on a joint return of husband and wife the maximum was \$5,000.

<sup>3</sup> Percentages based on unrounded numbers of tax returns and dollar amounts in thousands.

<sup>4</sup> Reported on returns with medical deductions. Does not include nondeductible medical expenses equal to 5 percent of adjusted gross income.

<sup>5</sup> Adjusted gross income less adjusted gross deficit.

<sup>6</sup> Adjusted gross deficit.

<sup>7</sup> Persons with gross incomes below \$600 are not required to file returns. However, many such persons do file returns, chiefly for the purpose of claiming refunds of tax prepayments; and those returns are included in the tabulation.

SOURCE: Data from the Internal Revenue Service.

tives for purchasing voluntary health insurance protection against large medical bills. At present, premiums paid for voluntary health insurance may be included as a medical care expense, but there is no special tax incentive for the purchase of this protection.

The American Hospital Association, through its Council on Government Relations, made known its view at the time of the hearings on the new revenue act. In a letter to the chairman of the Ways and Means Committee these views were stated as follows: "Hospitals recog-

nize that many hospital and medical expenses that impose severe financial burdens upon families and individuals are not deductible because they do not exceed 5 percent of income. Where an extensive illness occurs, it often seems that the maximum of \$1,250 hurts most the people who most need this help. But the problem cannot be solved by removing all limits. There are some economic implications in any complete removal of limitations which ought to be explored by the committee. As limits are lowered, there will be more deductions claimed and there



may need to be closer scrutiny of the nature and propriety of these deductions. Not all minor medical expenses are a handicap to income earning, and there is much to be said for limiting this form of relief to catastrophic situations, where these can be defined. . . . The American Hospital Association would generally favor (1) allowing the cost of voluntary health insurance to be deducted from taxable income without regard to fixed minimum percentage of income, and (2) some liberalization in medical expense deductions" (13a).

### Health Manpower, Training and Research

The new revenue code contains a number of provisions affecting training and research expenditures. Among these provisions are the broadened definition of dependents, the clarification of the tax status of scholarships and fellowships, the liberalized deductions for contributions to hospitals and educational institutions, and special deductions for care of dependents.

#### *Definition of Dependents*

Although the Congress rejected proposals for tax deductions for higher education expenses, the new revenue code gives some recognition

**Table 4. Private expenditures for medical care, 1950 and 1953<sup>1</sup>**

[In millions]

Item	1950	1953
Total.....	\$8, 117	\$9, 866
Hospital services.....	2, 121	2, 825
Physicians' services.....	2, 467	2, 859
Dentists' services.....	869	943
Other professional services.....	476	562
Medicine and appliances.....	1, 885	2, 192
Administrative and other net costs of medical care insurance.....	299	485
Insurance for hospital services.....	189	284
Insurance for physicians' services.....	110	201

<sup>1</sup> Based on data from Department of Commerce, 1954 National Income Supplement to Survey of Current Business. Excludes public expenditures for medical care and direct expenditures for nonhospital services by philanthropic organizations. Includes industrial expenditures for health insurance.

SOURCE: Voluntary insurance against sickness; 1948-53 estimates. Social Security Bulletin 17: 5, December 1954.

to the costs to parents of financing students through long periods of academic training and to the current levels of even sporadic earnings of full-time students. The American Council on Education, in testifying before the Ways and Means Committee, described the problems imposed by the earlier revenue provisions as follows: "It means that hundreds of thousands of students spend a considerable portion of their free time in enforced idleness. It places heavy financial burdens on their parents at a time when they can least afford to meet them. It makes it impossible for many poor, but worthy students, to attend institutions of higher learning because of the monetary limitation" (13b).

Before the enactment of the code of 1954, a \$600 exemption was granted a taxpayer for a dependent if the dependent had a gross income of less than \$600 a year. The new revenue act liberalizes this provision by permitting children to be counted as dependents for purposes of exemptions even though they earn income in excess of \$600 a year. The children for whom an exemption may be claimed must be under the age of 19 or full-time students at an educational institution. Moreover in determining whether an exemption may be claimed for a child—that is in determining whether the taxpayer provides half or more of the support of the child—the new code permits any scholarships received for study at an educational institution to be ignored in applying the support test.

The problem of dependency credits for students attending medical or dental schools is especially significant because of the extended period and high cost of training and the proportion of students who work. Counts and Stalnaker, in a recent study on the cost of attending medical school, point out that, on the average, students spend \$1,500 a year in addition to tuition and fees. Tuition at the schools included in their special study averaged (median value) \$800, making the total cost for a student year about \$2,300—or a total cost of \$9,200 for the completion of 4 years of medical training. Counts and Stalnaker found in their questionnaire survey of 6,251 medical students from 26 selected medical schools that parents were the most important source of income for the majority of students. Approximately 59 percent of the students financed their way by help (other



than loans) from parents. The median amount of income from parents was \$1,300 (14).

About 3 out of each 4 students reported income from vacation earnings, the median amount being \$550. In addition, about one-fourth of the students were employed other than during vacations and received cash payments for their work. A few of the students received services such as board, room, or laundry. Although some of the students were employed at the university where they were attending medical school, the majority had jobs outside the medical school. The median amount of earnings—other than vacation earnings—was \$450.

Parents of medical or dental students who are providing half or more of the support of their children will now be permitted to claim the student for purposes of personal exemption even though he earns more than \$600 a year. Although the student would be required to file a return, he could also claim a personal exemption of \$600. At the lowest income tax bracket, this change would mean a tax saving to the parent of \$120 a year. The reported income for parents in the study just cited averaged approximately \$7,000, which might make the average tax saving somewhat higher (14).

### *Scholarships and Fellowships*

Under earlier tax law there was no special provision regarding the treatment of scholarships and fellowships. The basic ruling of the Internal Revenue Service stated that the amount of a grant or fellowship was includible in gross income unless it could be established to be a gift. The ruling created considerable ambiguity.

The 1954 revenue bill adopted by the House of Representatives excluded scholarships or Federal grants from gross income, but severely limited the types of grants which could be excluded. For example, the House bill specified that postdoctoral fellowships and scholarships could be excluded only if the annual amount of the grant, plus any compensation received from a previous employer, was less than 75 percent of the recipient's earnings in the year preceding the grant.

The American Cancer Society, through its executive vice president, testified that under

earlier law their fellowship stipends were ruled by the Internal Revenue Service to be gifts. Although they were not taxable earlier, under the bill as passed by the House the stipends granted by the American Cancer Society would have become taxable because the minimum grants were usually more than 75 percent of the pre-fellowship earnings. The Senate committee, to take account of the problems raised, adopted an exclusion of \$300 per month of postdoctoral grants as a substitute for the 75 percent rule in the House bill.

The new revenue code excludes scholarship and fellowship grants from gross income with certain limitations. The exclusion extends to the value of services and accommodations, such as room, board, and laundry, which are received as part of the grant. It also extends to the amount received for travel, research, clinical assistants, or equipment to the extent that the sums are spent for these purposes.

The exclusion of grants to candidates for degrees does not apply to that portion of any amount received which represents payment for teaching, research, or other services in the nature of part-time employment required as a condition for receiving the grant. However, services required for all candidates for a particular degree are not to be considered part-time employment. For individuals who are not candidates for degrees, such as those receiving postdoctoral fellowships, the exclusion is limited to \$300 a month for a maximum period of 36 months. Moreover, the grant may be excluded only if the grantor is a tax exempt organization or a Government agency.

The National Institutes of Health has prepared a summary statement on Public Health Service research fellowships for persons interested in applying for these fellowships. The provisions of the Internal Revenue Code of 1954 as they relate to fellowship awards are included in this summary statement (15). In general, postdoctoral awards would not be taxable under the new code because the amount of the awards is below the \$300 a month maximum.

### *Charitable Contributions*

The principle of providing an incentive to taxpayers to contribute to charitable causes has long been recognized in income-tax law. In

1952 the maximum allowed deduction for total charitable contributions was raised from 15 to 20 percent of income. The 1954 revenue code allows this limit to be exceeded to the extent that this excess represents contributions to hospitals, educational institutions, or churches. However, this excess may itself in the aggregate not exceed 10 percent of adjusted gross income. In addition, corporations that are limited in their deductions for charitable contributions to 5 percent of taxable income may carry over to the succeeding 2 taxable years any contributions in excess of the 5-percent limit.

In explanation of the changes, the House Ways and Means Committee reported: "This amendment by your committee is designed to aid these institutions in obtaining the additional funds they need in view of their rising costs and the relatively low rate of return they are receiving on endowment funds" (4a).

A number of groups appeared in support of continued Federal recognition of the role of voluntary nonprofit health organizations and education institutions through provision by the tax deductions of incentives to contribute to charitable causes.

#### *Child Care Expenses*

During the course of consideration by the House Ways and Means Committee of deductions for child care, the American Nurses Association presented its position in support of allowing working women to deduct the amount spent for child care for income tax purposes. In the course of the testimony Julia Thompson, representing the American Nurses Association, indicated that approximately 20 percent of the Nation's 335,000 active nurses would be immediately affected by this legislation. Miss Thompson also pointed out that of the 220,000 inactive nurses, approximately 58 percent have dependents under 18 years of age.

"The American Nurses Association believes that there are many of these inactive nurses—highly trained women greatly needed in hospitals and health agencies—who are willing and able to take nursing jobs but cannot do so because they will not earn enough to pay for help to take care of their children while they work. . . . It would seem that the proposed amendment to the Internal Revenue Code

would help relieve the situation by enabling inactive nurses with children to return to their profession on an economical basis" (13c). Dr. William S. McNary of the American Hospital Association, in a letter to the chairman of the committee, also indicated the potential effect of the income tax change on hospital manpower resources.

. In recognition of the special problems of expenses for child care a new deduction was introduced by the 1954 revenue code. A deduction up to \$600 is allowed for expenses paid by a workingwoman or widow for the care of a dependent child or stepchild under 12 years of age or for the care of any dependent who is physically or mentally incapable of caring for himself. The care must be for the purpose of enabling the taxpayer to be employed.

The deduction is limited, moreover, in the case of a working wife. In such cases the deduction is allowed only if she files a joint return with her husband, and the deduction is reduced by the amount by which the combined adjusted gross income of both husband and wife exceeds \$4,500, except where the husband is incapable of self-support because physically or mentally incapacitated.

The revenue bill as it passed the House restricted the allowable deduction of workingwomen to widows or those with incapacitated husbands and to expenses for the care of a child under 10 years of age. Various groups testified before the Senate Finance Committee on the need for liberalization of the deduction. Among those supporting liberalization were the United Cerebral Palsy Association and Dr. George G. Deaner of the Institute of Physical Medicine and Rehabilitation. The Senate Finance Committee, in reporting out changes in the House bill which were later voted by the Senate and accepted by the Conference Committee, stated: "Your committee's action in extending the deduction recognizes that similar financial problems may be incurred by taxpayers who, if they are to be gainfully employed, must provide care for physically or mentally incapacitated dependents other than their children. Moreover, it is recognized that in many low-income families, the earnings of the mother are essential for the maintenance of minimum living standards, even where the

father is also employed, and that in such situations the requirement for providing child care may be just as pressing as in the case of a widowed or divorced mother" (16).

## Definition Problems Ahead

This brief summary of selected provisions of the new revenue code suggests the number and variety of health and medical care questions on which tax decisions will be required. Earlier revenue statutes involved determinations of medical care cost items—what types of expenses are medical care expenses and which of the expenses fall outside of medical care costs. The extra personal exemption for the blind necessitated definitions of blindness.

The new code, however, goes further in the direction of tax relief for hardship cases involving disability and illness. Many additional questions of definition are involved. The new tax deduction provisions for employer-financed compensation for injuries or sickness require differentiation of payments for permanent injury and wage continuation payments for illness. They also require definition, for example, of "permanent loss or loss of use of a member or function of the body," of "sickness," of a period of hospitalization and of continuous illness. The new deduction for expenses for care of dependents requires differentiation of expenses for "drugs and medicine" from other medical care costs as well as definition of "drugs and medicine." The additional deduction for designated types of charitable contributions requires definition of a "hospital." Problems of definition are currently being explored by the Internal Revenue Service, and clarifying regulations are being issued from time to time. Determinations in application of these definitions to individual cases will be the task of that administrative agency in the period ahead.

## REFERENCES

- (1) U. S. Department of Commerce. Office of Business Economics: National income supplement to the Survey of Current Business. 1954 edition. Washington, D. C., U. S. Government Printing Office, 1954, pp. 210-211.

- (2) Klem, M. C., and McKiever, M. F.: Management and union health and medical programs. Washington, D. C., U. S. Government Printing Office, 1953, p. 62.
- (3) Guttentag, J. H., Leonard, E. D., and Rodewald, W. Y.: Federal income taxation of fringe benefits; A specific proposal. *Nat. Tax. J.* 6: 250-272, September 1953.
- (4) U. S. House of Representatives, Committee on Ways and Means: Internal Revenue Code of 1954. H. Report 1337. 83d Cong., 2d sess. Washington, D. C., U. S. Government Printing Office, 1954, (a) p. 15; (b) p. 25.
- (5) U. S. Bureau of Employment Security: Temporary disability insurance; Problems in formulating a program administered by a State employment security agency. Washington, D. C., The Bureau, revised 1953, 70 pp.
- (6) Voluntary insurance against sickness; 1948-1953 estimates. *Soc. Sec. Bull.* 17: 3-9, December 1954.
- (7) U. S. Senate Committee on Finance: Hearings . . . H. R. 8300. The Internal Revenue Code of 1954. Part 1. 83d Cong., 2d sess. Washington, D. C., U. S. Government Printing Office, 1954, p. 127.
- (8) U. S. Treasury Department: Summary of the act to revise the internal revenue laws of the United States, 1954. Washington, D. C., The Department, Oct. 1, 1954, 72 pp.
- (9) U. S. Senate Committee on Finance: The Revenue Bill of 1942. S. Report 1631, 77th Cong., 2d sess. Washington, D. C., U. S. Government Printing Office, 1942, p. 6.
- (10) Jensen, J. E.: Rationale of the medical expense deduction. *Nat. Tax J.* 7: 274-284, September 1954.
- (11) Jensen, J. E.: Medical expenditures and medical deduction plans. *J. Polit. Econ.* 60: 503-524, December 1952.
- (12) Anderson, O. W.: National family survey of medical costs and voluntary health insurance. New York, N. Y., Health Information Foundation, 1954, p. 25.
- (13) U. S. House of Representatives, Committee on Ways and Means: Hearings . . . General revenue revision. Part 1. 83d Cong., 1st sess. Washington, D. C., U. S. Government Printing Office, 1953, (a) p. 114; (b) p. 22; (c) p. 51.
- (14) Counts, S., and Stalnaker, J. M.: The cost of attending medical school. *J. M. Educ.* 29: 20-25, February 1954.
- (15) U. S. National Institutes of Health: Research fellowships. Bethesda, Maryland, The Institutes, 1954.
- (16) U. S. Senate Committee on Finance: Internal Revenue Code of 1954. S. Report 1635, 83d Cong., 2d sess. Washington, D. C., U. S. Government Printing Office, 1954, p. 36.

# The American Diabetes Association

By JOHN A. REED, M.D.

PROFESSIONAL education, patient education, public education and case finding, and research are the four major interests of the American Diabetes Association, which was established and incorporated as a medical organization in 1940. The association is a nonprofit membership organization and the only national nongovernment or voluntary group in the field of diabetes in the United States.

During its early years, the American Diabetes Association was concerned largely with clinical investigation and basic research pertaining to the problems of diabetes mellitus. Recently, however, it has carried out many of the functions of a voluntary health agency, although it has maintained its identity in structure as a medical organization.

The broad objectives of the association, in the language of its constitution and bylaws, are "to further the general welfare through acquisition and dissemination of useful and accurate knowledge and information regarding diabetes mellitus and to undertake in the public interest such activities as will improve the physical welfare of persons having that disorder." To these ends, the association strives:

- To promote among physicians and others the free exchange of knowledge with respect to diabetes mellitus.
- To improve the standards of treatment.
- To promote medical research by individuals, hospitals, clinics, universities, and other institutions.
- To educate the public in the early recognition of the disease and in the importance of medical supervision of its treatment.
- To distribute accurate information to the general public by literature, meetings, and other appropriate means.
- To develop educational methods designed to give diabetic patients a better understanding of their disease.
- To encourage the formation of subsidiary groups which will cooperate actively with the association in its program.

The active membership of the association consists of about 2,000 physicians and persons in related scientific fields whose primary interest is in diabetes mellitus. In addition, there are associate, honorary, and corporate members, who assist in the organization's work but are not entitled to vote.

The affairs of the association are managed by a council, which is composed of 18 persons elected by and from the active membership, the 5 principal officers of the association, and the 3 most recent living past presidents.

Financial support for the organization comes from membership dues; self-supporting projects, such as a professional journal, a magazine for diabetic patients, and a series of post-graduate courses; voluntary contributions by individuals, primarily diabetic patients; and

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*Dr. Reed, who served for 6 years as secretary of the American Diabetes Association, was elected second vice president of the association in June 1955. He is also an assistant clinical professor of medicine, George Washington University School of Medicine, and has served as a member of the National Advisory Arthritis and Metabolic Disease Council, National Institutes of Health, Public Health Service.*

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well as to provide for them ordinary camping experiences. The affiliates also promote professional and nonprofessional education in diabetes in their own communities through lectures and public forums, and they are a major force in the conduct of the annual diabetes detection drive.

### **Toward Early Control**

Because of the degenerative complications which develop in a high percentage of diabetic patients, it is of utmost importance that control of the disease be established early and maintained. It is generally accepted that good chemical control of the disease prevents the disabling complications to a great extent. With proper treatment, a person with diabetes can work efficiently and with no more loss of time from the job than a person who does not have

this ailment. It has been estimated that there are now nearly 200,000 diabetic patients in the labor force.

Diet is the essential part of control, but insulin in addition to diet is necessary in about 50 to 75 percent of the cases. Through close cooperation between the patient and the physician, good diabetic care can be achieved. The life span of the diabetic patient today can be practically normal.

Over and above the current program, a great deal must be done to accomplish the American Diabetes Association's four major objectives. For the immediate future, the association will seek an increase in the number of affiliate associations; an extension of the postgraduate course series, especially to regional and State levels; expansion of the diabetes detection drive; and an increase in the number of fellowships for research work.

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## **National Sanitary Engineers' Register**

At the request of the Office of Defense Mobilization, the Public Health Service is developing a National Register of Sanitary Engineers, as a phase of the program of the National Science Foundation.

In 1949, the American Public Health Association prepared a National Roster of Sanitary Engineers for the National Security Resources Board. Maintenance of that roster was discontinued a few years ago. The Public Health Service used that list and drew on the association's experience.

The American Public Health Association, the American Society of Civil Engineers, the American Water Works Association, the Federation of Sewage and Industrial Wastes Association, the Conference of Public Health Engineers, the Conference of State Sanitary Engineers, and the registration boards in each State have supplied their membership lists. A master mailing list of over 10,000 names of sanitary engineers has been developed from these and other sources.

A 1-page information sheet, prepared in cooperation with the Engineers' Joint Council and the National Science Foundation, will be sent to each engineer whose name is on this list. A letter from Assistant Surgeon General Mark D. Hollis, chief engineer of the Public Health Service, to accompany the information sheet, will ask each recipient to read the National Research Council's definition of a sanitary engineer before transmitting his reply. By this means, details on the engineer's education, his professional experience, and his sanitary engineering specialty will be recorded on the register.

grants by corporations and foundations. The association does not engage in any general public fund-raising campaigns.

### Public Education and Case Finding

Education of the public concerning the prevalence of diabetes mellitus and the necessity for early discovery of the disease is of major importance. The number of diabetic patients now under medical care has been estimated to be well over one million, and there is probably an almost equal number of persons who have the disease but are unaware of it. Diabetes stands eighth in the list of known causes of death.

A program of public education and case finding, known as the diabetes detection drive, was established about 7 years ago for the purpose of finding persons with undetected diabetes. The drive is directed through local affiliates of the American Diabetes Association and the committees on diabetes of county and State medical societies, with assistance from public health groups and various local organizations. Activities are conducted throughout the year, but the greatest effort is made in observance of Diabetes Week, which is the third week of November.

The American Diabetes Association uses all mass communications media to focus the attention of the public on the detection drive, while the local affiliates and the committees on diabetes of county and State medical societies obtain the support of newspapers and radio and television stations in their areas.

Any public or voluntary health group which desires to cooperate in the diabetes detection drive, and especially in Diabetes Week activities, may do so through a local affiliate of the ADA. In areas where there is no ADA affiliate, proposed plans may be channeled through the committee on diabetes of the county or State medical society, which, in the absence of an ADA affiliate, assumes full responsibility for the drive. Many health departments, of course, are also undertaking diabetes detection programs.

Other ADA activities in public education include the showing of an exhibit entitled,

"What is Diabetes?" This exhibit, which was prepared by the association in 1954, has already been shown at county fairs and medical centers in 17 cities. Ten sets of the exhibit are now in circulation.

### Professional Education

Although the American Diabetes Association is one of the younger medical groups, it already has developed a broad program of professional education for its members. This program includes annual scientific meetings; an annual postgraduate course in diabetes and basic metabolic problems; publication of the monthly professional journal *Diabetes*; publication of the Diabetes Guide Book for the Physician, of which more than 150,000 copies have been distributed; preparation and showing of exhibits; and community meetings of the physician membership of the local affiliates.

The postgraduate course, which has been offered yearly since 1953, provides refresher and review training for persons engaged in the clinical practice of diabetes mellitus and for those preparing for American Board of Internal Medicine examinations. The American Academy of General Practice allows 20 hours of postgraduate credit to persons who attend the course. The course is under the direction of the association, and the faculty consists of outstanding men in the fields of clinical metabolism and experimental metabolism. The third in the series was presented January 19 through 21, 1955, at the Lankenau Hospital, Philadelphia.

To date, the association has prepared three exhibits for use in professional education: "Diabetes Detection by the Physician," "Vascular Complications of Diabetes," and "Management of Diabetes Mellitus." These are shown regularly at the annual meetings of the American Medical Association and the American Academy of General Practice, and at State and regional medical meetings throughout the United States.

### Patient Education

Patient education is a phase of the association's program which is almost limitless in its

Through special gifts and grants, research funds have been established for the purpose of widening the knowledge of diabetes mellitus and its control. At the present time, the research program is limited to the granting of fellowships. Dr. Charles H. Best, co-discoverer of insulin, is chairman of the association's Committee on Research and Fellowships, which includes eight eminent investigators and clinicians.

## Research

One of its most far-reaching activities is the publication of a bimonthly magazine for diabetic patients, the *ADA Forecast*, which is now 8 years old. Written and edited for diabetic patients, it contains contributions by medical authorities and many articles by patients themselves. In response to requests from patients and their families, reprints have been made available of a large number of informative articles selected from back issues of the publication. Answering inquiries from diabetic patients and their families is another activity of importance. Each year, the association receives several thousand letters asking questions about diabetes mellitus. Some can be answered with printed materials, but those asking specific questions receive the careful attention of competent medical men.

For use in teaching diabetic patients about their ailment and its control, the association has cooperated with the Public Health Service in producing an audiovisual kit. Also, it has co-operated with the Public Health Service and the American Dietetic Association in the publication of food exchange pamphlets and food lists for use by patients.

The ADA Committee on Employment has set up standards of employment for persons with diabetes. These standards have been of considerable value to employers and patients alike. In addition to these activities, many of the local affiliates have formed societies of laymen for the purpose of providing mass instruction and general discussion on diabetes for patients and other interested persons.

The governor also serves as senior delegate from his respective State to the ADA Assembly of Delegates, which is an advisory body to the ADA Council. Each affiliate also elects one physician and one layman, if there is a lay society, to the Assembly of Delegates.

One of the projects of great interest in the affiliates is the support of camps for diabetic children. At the present time, there are 24 such camps, most of which are owned or sponsored by affiliates. These camps afford opportunities to educate the children in the maintenance of proper control of their condition, as

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The affiliate serves the community by bringing together the physicians who are primarily interested in the disorder and the diabetic patients, their families, and their friends.

In order to strengthen the ties between the national organization and the local groups. He will participate in the development of all phases of the ADA program, particularly the strengthening of existing affiliates and the formation of new ones. Because of his awareness of the local situations, the governor is in an excellent position to serve in the capacity of adviser.

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# The Specific Heat of Garbage

By E. ROBERT BAUMANN, Ph.D., and CHARLES S. OULMAN

**L**AWS or regulations in 45 States now require that garbage intended for animal feed be cooked to destroy pathogenic organisms. Most States require that the garbage be heated to a temperature of 212° F. and be held at this temperature for at least 30 minutes. To comply with these laws (1), hog feeders have built a wide variety of equipment for cooking garbage. Some of the garbage cookers show considerable ingenuity, but ingenuity alone is not enough for an efficient design. To evaluate the factors involved in the design of suitable equipment for the heat treatment of garbage, two research groups at Iowa State College have recently undertaken a project titled "Survival of Swine Disease Organisms in the Heat Treatment of Garbage." This study is being conducted by the Iowa Engineering Experiment Station and the department of veterinary medicine of Iowa State College under grant RG 3985 (C) from the National Institutes of Health.

One of the major factors to be considered in the design of a garbage cooker is the amount of heat required to destroy pathogenic organisms. The size of the burner used with direct-fired kettles and the amount of steam required for steam-injection cookers depends on the amount of heat that must be available to raise the tem-

perature of the garbage to 212° F. The heat required to raise the temperature of the garbage without considering heat losses may be calculated by the following formula:

$$W \times \Delta T \times C_p = \text{B.t.u. required}$$

when  $W$  = weight of garbage in pounds.

$\Delta T$  = 212° F. minus the temperature of garbage before cooking, degree F.

$C_p$  = specific heat of garbage in B.t.u. per pound per degree F. temperature rise.

B.t.u. = British thermal unit, the quantity of heat required to raise the temperature of 1 pound of water 1° F. at or near its point of maximum density.

Specific heat may be defined as the number of B.t.u. of heat required to raise 1 pound of a material 1° F. The specific heat of water is 1.0. The specific heat of almost all other materials, including garbage, is less than 1.0. The specific heat of garbage is not constant but will vary with the moisture content and the composition of the garbage solids. Since the moisture content of garbage will usually be between 65 percent and 85 percent (2-4), many engineers (5) have used a garbage specific heat of 1.0 for purposes of calculating heat requirements. Others, on the other hand, have based their calculations of heat requirements for garbage on specific heat values varying from 0.50 to 0.90 (6). No reliable bases for these assumptions have been reported in the literature.

In the study of the survival of swine disease organisms being conducted at Iowa State College, numerous types of equipment and cooking methods are being employed. Routine observa-

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*Dr. Baumann is associate professor of civil engineering, Iowa State College, Ames, Iowa, and Mr. Oulman is a student assistant.*

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tions are being made of heat losses and heat transfer coefficients obtained with each piece of equipment. A more accurate value of specific heat of garbage should be used to calculate these data with a reasonable degree of accuracy. The purpose of this paper is, therefore, to present a method for estimating the specific heat of garbage with sufficient accuracy for design purposes.

### Specific Heats of Foods

Garbage fed to hogs is usually commercial garbage (1). Commercial garbage is obtained from restaurants, cafeterias, hospitals, hotels, and other public eating places. It is primarily waste food, and as such, the specific heat of the garbage should be very nearly the same as that of the food products that it contains.

The specific heats of many foods have been reported in the literature (7-9). For the most part, the specific heats vary approximately directly with the moisture content. When heated, food may be assumed to behave as a mechanical mixture of food solids and water (10). Some research workers have found that this assumption is in error for temperatures in the freezing zone, but the assumption will give good results for temperatures above 40° F. (10). The specific heat of food (and garbage) may be determined, then, by a weighted average of the

specific heats of the food solids and of the water. On the basis of this assumption, specific heats, ( $C_p$ ) of the solid portion of various foods were determined as follows:

#### EXAMPLE 1

Broccoli<sup>1</sup> (90 percent water, 10 percent solids)
 

Specific heat due to water-----  $0.90 \times 1.00 = 0.90$   
 Specific heat due to solids-----  $0.10 \times C_p = \text{---}$   
 Specific heat of broccoli ( $C_f$ )<sup>1</sup> = .93  
 Specific heat of food solids ( $C_p$ ) =  $\frac{0.93 - 0.90}{0.10} = .30$

<sup>1</sup> Reference 7.

Table 1 lists average values and ranges of values of percentage of moisture and specific heats for representative types of food products calculated from data reported by others (7-9).

The specific heats of most food solids vary from 0.15 to 0.45, with an average value of about 0.33. This rather wide variance in values can be explained by the high moisture content of food and the low specific heat of the food solids. On the average, the moisture content of food is about four times as great as the food solids content, and the specific heat of this water portion is about three times as great as the specific heat of the solids. Therefore, a relatively small variance in the determination of the moisture content of the food can produce a rather large variance in the determination of the specific heat of the food solids.

Table 1. Specific heats of foods

Food	Average values			Range of values		
	Percent moisture	$C_f$ <sup>1</sup>	$C_p$ <sup>2</sup>	Percent moisture	$C_f$	$C_p$
Meat-----	60. 1	0. 717	0. 343	20 -90	0. 48-0. 93	0. 150-0. 408
Fish and seafoods-----	71. 0	. 783	. 288	60 -80	. 72- . 90	. 200- . 486
Fowl-----	57. 2	. 750	. 420	52 -65	. 70- . 80	. 375- . 500
Vegetables:						
Green leafy-----	87. 6	. 930	. 302	65 -97	. 76- . 98	. 125- . 500
Squash, and so on-----	92. 6	. 932	. 295	83. 7-97	. 72- . 974	. 227- . 333
Beans and peas-----	51. 3	. 676	. 367	12 -92	. 85- . 91	. 182- . 677
Potatoes, carrots, and so on-----	85. 4	. 888	. 306	75 -95. 8	. 79- . 972	. 167- . 400
Fruit:						
Berries-----	79. 1	. 861	. 348	78 -94	. 53- . 92	. 118- . 800
Apples, pears, and so on-----	82. 5	. 891	. 366	65 -90	. 80- . 96	. 167- . 743
Oranges, lemons, and so on-----	88. 6	. 917	. 267	81 -92. 5	. 89- . 945	. 154- . 580
Dairy products:						
Milk products-----	58. 3	. 777	. 441	10 -87	. 64- . 92	. 267- . 683
Eggs-----	68. 5	. 783	. 310	48 -87	. 67- . 92	. 111- . 385
Bread-----	46. 0	. 67	. 388	44 -48. 5	. 65- . 68	. 375- . 418

<sup>1</sup>  $C_f$ —specific heat of the food.
 <sup>2</sup>  $C_p$ —specific heat of the food solids.

## EXAMPLE 2

Specific heat of broccoli,  $C^1=0.93$

Percent moisture	Specific heat of food solids ( $C_p$ )
91-----	0.22
90 <sup>1</sup> -----	.30
89-----	.36

<sup>1</sup> Reference 7.

Conversely, values of the specific heat of food solids that are considerably in error may be used without introducing an appreciable error in the value computed for the specific heat of the food. Table 2 lists nine foods and their respective specific heats. The specific heats of the foods in this table, as computed by using an average value of specific heat of 0.33 for the food solids, are compared with the specific heats that were reported by others (7-9). Two conclusions may be drawn from table 2. First, the variance in the calculated value of specific heat for a food is small when the average value (0.33) is used for the specific heat of the food solids. Second, the variances are smallest if the water content of the food is high.

**Table 2. Variations in specific heats of foods**

Food	Percent moisture	Specific heat of food	Computed specific heat of food	Percent variance
Beef, boiled <sup>1</sup> -----	57	0.73	0.71	2.7
Butter <sup>1</sup> -----	14	.49	.42	4.3
Ice cream <sup>2</sup> -----	67	.80	.78	2.5
Milk <sup>2</sup> -----	87	.92	.92	.0
Parsnips <sup>2</sup> -----	79	.86	.86	.0
Peas, green <sup>2</sup> -----	74	.85	.83	2.4
Potatoes, boiled <sup>1</sup> ---	80	.87	.87	.0
Strawberries <sup>2</sup> -----	90	.92	.93	1.1
White bread <sup>1</sup> -----	44	.65	.62	4.6

<sup>1</sup> Reference 8.    <sup>2</sup> Reference 7.

## Specific Heat of Garbage

The water content of garbage ordinarily varies from 65 percent to 85 percent (2-4). Since garbage solids are food solids, the specific heat of garbage solids may be expected to approximate 0.33, the average specific heat of food solids. It is proposed, therefore, that the average specific heat of garbage be calculated as shown in example 1, using a specific heat for

the water of 1.0 and a specific heat for the solids of 0.33. Table 3 shows the relationship that exists between the percent of moisture in the garbage and the specific heat of the garbage if this assumption is made. The variances resulting from using the average value of specific heat for the food solids in the garbage should be rather small. The chart illustrates the variances resulting from using this average value for estimating the specific heat of a garbage for moisture contents of 65 percent and 85 percent. It also shows the variance in moisture content that will produce the same variance in the specific heat of the garbage.

## EXAMPLE 3

The average value of specific heat of food solids, 0.33, is used to calculate the specific heat of a garbage whose actual moisture content is 85 percent. The calculated specific heat of the garbage would be 0.90. If the actual specific heat of the food solids is 0.218, the specific heat of the garbage would be 0.883.

Variance in specific heat of food solids, 51 percent.  
Variance resulting in specific heat of garbage, 1.9 percent.

Variance in moisture content which would cause an equivalent variance in specific heat of the garbage, 3.0 percent.

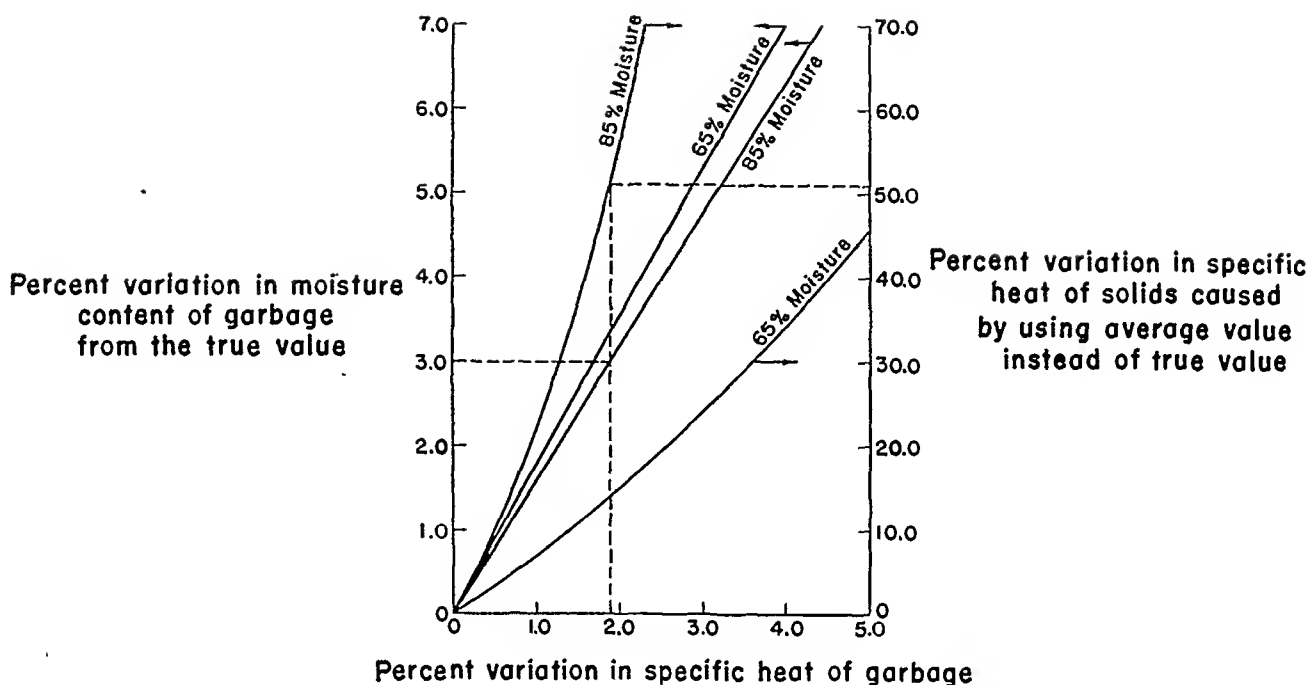
(This would result if a moisture content of 82.4 percent were used instead of the actual value of 85 percent.)

In most estimates of specific heat, the use of an average value of specific heat for the food solids should be sufficiently accurate. However,

**Table 3. Relationship between moisture content and specific heat of garbage <sup>1</sup>**

Percent moisture	Specific heat of garbage	Percent moisture	Specific heat of garbage
100-----	1.000	74-----	0.826
95-----	.97	73-----	.82
90-----	.93	72-----	.81
85-----	.90	71-----	.806
84-----	.89	70-----	.80
83-----	.886	69-----	.79
82-----	.88	68-----	.786
81-----	.87	67-----	.78
80-----	.866	66-----	.77
79-----	.86	65-----	.766
78-----	.85	60-----	.73
77-----	.846	55-----	.70
76-----	.84	50-----	.665
75-----	.83		

<sup>1</sup> Specific heat of water, 1.0; specific heat of garbage solids, 0.33.



if the makeup of the garbage is known, additional accuracy might be attained by computing a specific heat of solids for that particular garbage. Values of the specific heat of food solids can be used for computing this value if the approximate solids composition and moisture content of the garbage are known.

#### EXAMPLE 4

For a garbage known to contain :

Food	Amount	$C_p^1$
White bread	$0.30 \times 0.375 = 0.11$	
Potatoes	$.30 \times .350 = .11$	
Parsnips	$.15 \times .333 = .05$	
Peas	$.10 \times .423 = .04$	
Beef	$.05 \times .372 = .02$	
Milk	$.05 \times .360 = .01$	
Ice cream	$.03 \times .394 = .01$	
Butter	$.02 \times .407 = .01$	

Average  $C_p = .37$

<sup>1</sup>  $C_p$  = Specific heat of food solids.

For a moisture content of 75 percent :

Specific heat due to water  $(0.75 \times 1.00) = 0.75$   
 Specific heat due to solids  $(0.25 \times 0.37) = .09$

Specific heat of garbage = .84  
 Calculated specific heat of the garbage = .83

Because the makeup of different lots of garbage from the same source will vary considerably, the use of an average specific heat of food solids in calculating the specific heat of garbage

will probably give results as good as any that might be computed for it on the basis of its assumed makeup.

#### Laboratory Studies

To verify the accuracy of the calculated value of the specific heat of garbage, some experiments were run in the laboratory to determine the specific heat of several samples of garbage. In these tests, garbage samples were homogenized in a blender and tested in a homemade calorimeter. The laboratory tests were found to give a value of garbage specific heat within about 3 percent of the specific heat calculated on the basis of the proposed method. The proposed method should be checked, however, using a food calorimeter of the type in operation at the University of Texas (10).

#### Conclusions

1. The specific heat of garbage may be calculated with reasonable accuracy when the water fraction of the garbage is assumed to have a specific heat of 1.0 and the solids fraction is assumed to have a specific heat of 0.33.

2. The specific heat of garbage will normally range between 0.77 and 0.90 for moisture contents of 65 percent and 85 percent, respectively.

3. For determining the amount of heat re-

quired for cooking garbage, the specific heat should be assumed to be 1.0 if heat losses are not considered and 0.9 if heat losses are considered.

• • •

*Tabulated values of moisture contents and specific heats for various foods may be obtained from the authors on request.*

#### REFERENCES

- (1) Baumann, E. R., and Skodje, M. T.: Garbage cooking in Iowa. Pub. Health Rep. 70: 314-318, March 1955.
- (2) Bush, W. A.: Converting garbage to feed, fertilizer, and grease. Sewage Works Engineering 18: 248-251, May 1947.
- (3) Babbitt, H. E.: Engineering in public health. New York, N. Y., McGraw-Hill Book Company, 1952, p. 378.
- (4) Palmer, C. L., and Nusbaum, I.: Ground garbage studies at Detroit. Sewage and Indust. Wastes 23: 1113-1117, September 1951.
- (5) Application Bulletin. Oakland, Calif., Storm, Inc., 1953, p. 4.
- (6) California Legislature: Statement before the hearings, Committee on Agriculture and Livestock Problems. El Monte, Calif., Clayton Manufacturing Co., July 5, 1954, p. 4.
- (7) Ordinanz, W. O.: Specific heats of foods in cooking. Food Industries 18: 1869, December 1946.
- (8) King, G. R.: Basic refrigeration. Chicago, Ill., Nickerson and Collins Co., 1951, pp. 458-461.
- (9) Venemann, B. G.: Refrigeration theory and application. Chicago, Ill., Nickerson and Collins Co., 1942, pp. 234-235.
- (10) Short, B. E., Woolrich, W. R., and Bartlett, L. H.: Specific heat of foodstuffs. Refrigerating Engineering 44: 385-388, December 1942.

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## To Develop Cancer Drugs

A national voluntary program of cooperative research and development to find and produce effective drugs for the treatment of cancer has been launched under sponsorship of the American Cancer Society, Atomic Energy Commission, Damon Runyon Memorial Fund for Cancer Research, the Veterans Administration, the Food and Drug Administration, and the Public Health Service National Cancer Institute.

General guidance of the program will come from the Cancer Chemotherapy National Committee, established May 14, 1955, as the top policymaking body. The committee will define the scope of the program, develop general policies, assist in obtaining financial support for the work, coordinate the activities of the sponsoring organizations, and observe the rate of progress of the entire effort.

The committee will be headed by Dr. Sidney Farber, scientific director of the Children's Cancer Research Foundation in Boston and also chairman of the Chemotherapy Committee

of the National Advisory Cancer Council, Public Health Service.

Dr. Kenneth M. Endicott, National Cancer Institute, is executive secretary of the committee and in charge of the small full-time staff provided by the sponsoring agencies to administer the program, organize an information exchange, and give needed assistance to research scientists. Staff headquarters will be at the Cancer Chemotherapy National Service Center, National Institutes of Health, Public Health Service, Bethesda 14, Md.

Members of the committee are: Dr. Charles L. Dunham, Atomic Energy Commission; Mrs. Albert D. Lasker, National Advisory Cancer Council and American Cancer Society; Dr. Theodore S. Moise, Veterans Administration; Dr. C. P. Rhoads, Memorial Center for Cancer and Allied Diseases; Robert S. Roe, Food and Drug Administration; Dr. Antonio Rottino, Damon Runyon Memorial Fund; Mefford R. Runyon, American Cancer Society; and Dr. Leon A. Sweet, Parke, Davis and Company.

*A comparative study of the efficiency of dry heat, dry heat and formaldehyde, and formaldehyde in a moist atmosphere for the sterilization of used bedding.*

# Efficiency of Dry Heat and Formaldehyde in Sterilizing Used Bedding

By ROBERT S. LLOYD, M.S., and MILTON J. FOTER, Ph.D.

**D**RY HEAT alone or in combination with formaldehyde is among the methods recommended for the sterilization of bedding materials by a number of State and local government agencies. This method, however, is subject to many procedural variations.

Little information has been published on the commercial sterilization or disinfection of bedding materials by heat or by heat and formaldehyde. Sprague (1) used formaldehyde gas to sterilize hair and feather pillows, mattresses, and blankets. He reported that the presence of moisture and the evacuation of the sterilizing chamber prior to the introduction of formaldehyde gas enhanced the effectiveness of formaldehyde on porous materials. He also recommended the use of at least one-fourth as much formaldehyde solution as the liter capacity of the chamber. Nordgren (2) stated that the sterilization of porous materials by formaldehyde gas could be attained only through previous evacuation of the sterilizing chamber.

Gibbons and associates (3) reported that hot, moist air at 275° F. for 24 to 30 hours disinfected mattresses, and that the vaporization of 80 pounds of formalin per 1,000 cubic feet of capacity was more effective for sterilizing mattresses in an evacuated chamber than in a chamber under atmospheric conditions. The American Standards Association, Inc., Subcommittee on Bedding Sterilization (4) reported that only surface sterilization was achieved in mattresses exposed to 230° to 270° F. for 1½ to 2 hours and that the combination of dry heat and formaldehyde at atmospheric pressure did not produce complete sterilization of mattresses even at elevated temperatures for prolonged exposure times.

Other methods of sterilization which have been considered include the use of ethylene oxide or mixtures of ethylene oxide and carbon dioxide (5), methyl bromide (6), and dielectric heat (7).

## Methods and Materials

*Escherichia coli*, *Staphylococcus aureus*, *Mycobacterium phlei*, and spores of *Bacillus globigii* and *Aspergillus niger* were employed as test organisms for bedding contamination. The nonsporulating species were grown in a liquid nutrient medium at 98.6° F. for 24 hours.

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Mr. Lloyd is bacteriologist with the Milk and Food Protection Laboratory, Robert A. Taft Sanitary Engineering Center, Public Health Service, Cincinnati, Ohio. Dr. Foter is chief of the Aerobiology Unit, Bacteriology Section of the center.

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*B. globigii* and the mold species were grown in or on a special spore medium at 98.6° F. and 86.0° F., respectively, for 4 to 5 days. Filter paper strips (Whatman No. 3, 2¾ by ½ inches) were inoculated with 0.5 ml. of a cell or spore suspension. The culture strips were dried at room temperature and viable counts of the organisms on several strips picked at random were determined by agar plate procedure. The strips were then transferred to 4 by 2½ inch paper or cloth envelopes which were inserted in or on the bedding surface for exposure tests.

The presence of viable cells in the bacterial culture strips after exposure was determined by transfer from the envelopes to tubes containing tryptose-phosphate broth and glycerol broth, and the mold spore-inoculated strips were placed in neopeptone-dextrose broth. The tubes were then incubated for 1 to 2 weeks at the optimum temperature of the test organism. Subcultures of the exposed culture strips exhibiting growth were examined microscopically for identification of the surviving organism. Inoculated but unexposed culture strips were subcultured as controls. Test results were recorded as the survival or nonsurvival of the exposed organisms in the culture tubes after subculturing. Percentage survival of the exposed organisms was not determined.

Untreated, used cotton-felt and spring mattresses and specially made cotton-felt and spring mattress sections enclosed in zippered

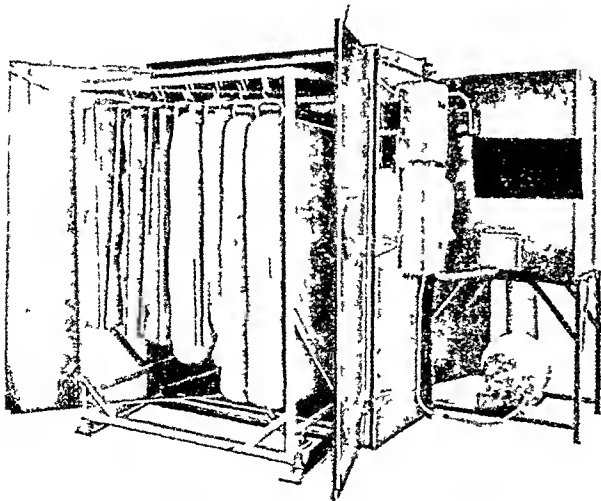


Figure 1. Electrically heated sterilizing chamber with 300 cubic feet capacity.

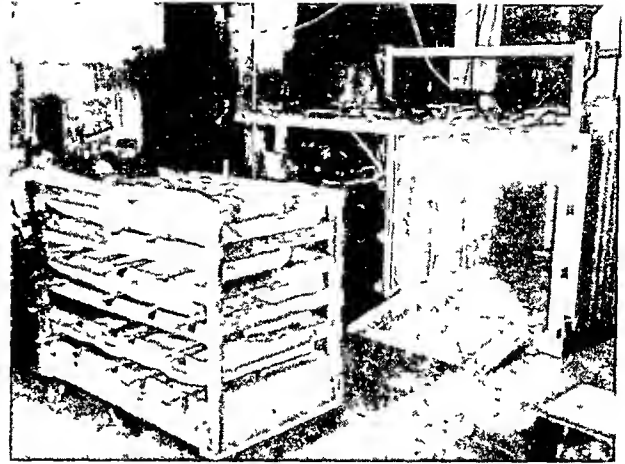


Figure 2. Nonpressure chemical sterilizing chamber with 300 cubic feet capacity.

mattress ticking were employed in the field studies. Samples of cored and uncored foam rubber (8½ by 4 by 1½ inches) wrapped in commercial mattress ticking were used in the laboratory studies. These materials were furnished by the Indiana State Board of Health, Indianapolis, Ind., and the Rubber Manufacturers Association, New York, N. Y.

### Field Investigations

The major part of the field studies were conducted in commercial, nonpressure, mattress sterilizing chambers of approximately 300 cubic feet capacity (figs. 1 and 2). Air temperatures at several positions within the chambers were registered by recording thermometers. Temperatures on the surface and inside the bedding were measured by thermocouples.

### Dry Heat

A number of the untreated, used mattresses and the zippered cotton-felt and spring mattress sections were placed horizontally on a mattress rack. Envelopes containing the inoculated and dried culture strips were attached to the surface of the top, middle, and bottom mattresses and inserted inside the zippered mattress sections. Additional thermocouples were also placed in these same locations to obtain temperature readings of the exposed bedding materials. The rack was transferred to a gas-heated chamber, which was equipped with a fan for circulating the air. Heat was introduced

until the desired test temperature, as recorded with a thermocouple unit, was reached inside the zippered spring mattress section. The exposure period was calculated from this point. Temperatures and exposure periods ranging from 230° F. for 2 hours to 270° F. for 1 hour were studied in these tests.

### *Dry Heat and Formaldehyde*

In these studies, untreated, used cotton-felt and spring mattresses were suspended vertically from the mattress rack. Thermocouples and envelopes containing test culture strips were placed inside and on the mattress surfaces. The rack was then transferred to an electrically heated chamber, which was also equipped with a fan for circulating the air. Gaseous formaldehyde was generated by heating a liquid so-

lution of 37 percent formaldehyde contained in a shallow dish on the chamber floor. Temperatures ranging from 230° F. to 250° F. for 1½ to 2¼ hours and quantities of formaldehyde ranging from 1 pint to 1 quart per 1,000 cubic feet were tested.

To ascertain the formaldehyde concentration during the exposure periods, air samples were collected from the chamber at various intervals during the exposure period. Gas washing bottles, containing fritted glass disks and 100 ml. of 5 percent sodium bisulfite, were used to collect the chamber air from sampling ports located on one side of the chamber near the top, in the middle, and just above the chamber floor. The samples, collected at a rate of 8 liters per minute for 10 minutes, were analyzed for formaldehyde by the sulfoxylate method (8).

**Table 1. Efficiency of dry heat in sterilizing contaminated mattresses**

Test temperature and exposure time	Chamber location of culture	Survival following exposure				
		<i>S. aureus</i>	<i>E. coli</i>	<i>Myco. phlei</i>	<i>B. globigii</i>	<i>A. niger</i>
230° F.—2 hours-----	Top front-----	0	0	0	0	0
	Top back-----	0	0	0	0	0
	Bottom back-----	0	0	0	+	0
	Middle center-----	0	0	0	+	0
	Inside innerspring mattress-----	0	0	0	+	0
	Inside cotton-felt mattress-----	+	+	+	+	+
250° F.—1 hour-----	Top front-----	0	0	0	0	0
	Top back-----	0	0	0	0	0
	Bottom back-----	0	0	0	+	0
	Middle center-----	0	0	0	+	0
	Inside innerspring mattress-----	0	0	0	+	0
	Inside cotton-felt mattress-----	0	0	0	+	+
250° F.—2 hours-----	Top front-----	0	0	0	+	0
	Top back-----	0	0	0	+	0
	Bottom back-----	0	0	0	+	0
	Middle center-----	0	0	0	+	0
	Inside innerspring mattress-----	0	0	0	+	0
	Inside cotton-felt mattress-----	0	0	0	+	0
270° F.—½ hour-----	Top front-----	0	0	0	0	0
	Top back-----	0	0	0	0	0
	Bottom back-----	0	0	0	+	0
	Middle center-----	0	0	0	+	0
	Inside innerspring mattress-----	0	0	0	+	+
	Inside cotton-felt mattress-----	0	0	0	+	+
270° F.—1 hour-----	Top front-----	0	0	0	0	0
	Top back-----	0	0	0	0	0
	Bottom back-----	0	0	0	0	0
	Middle center-----	0	0	0	+	0
	Inside innerspring mattress-----	0	0	0	+	0
	Inside cotton-felt mattress-----	0	0	0	+	0

0=No growth after subculturing and incubation for at least 1 week.

+ =Growth after subculturing and incubation for at least 1 week.



The experimental commercial chambers for the study were made available by James Miller, Fred Franke Co., Louisville, Ky. and Otis Auer, Docona Associates, Glen Ridge, N. J. Technical assistance in gas sampling and analysis and in the development of operational procedures was given by H. G. Porter and Bruce Turney, Indiana State Board of Health, Indianapolis, Ind. and John Perkins of the American Sterilizer Co., Erie, Pa.

### Laboratory Investigations

Because of the increased use of foam rubber in bedding materials, laboratory tests were made to determine the physical effects of steam under pressure (248° F. at 15 pounds per square

inch), dry heat (230° F.), and heat and formaldehyde in a humid atmosphere on foam rubber. Cored and uncored foam rubber samples, wrapped in mattress ticking, were employed in these tests. Unwrapped samples were also used for comparative purposes. Culture strips, containing the test organisms, were inserted in the samples to determine the bactericidal efficiency of formaldehyde and heat under moist conditions.

A standard laboratory hot air oven and an autoclave were employed in the heat and steam under pressure studies. The formaldehyde tests were conducted in a 1.5 cubic foot laboratory chamber in which liquid formaldehyde was vaporized from a shallow dish placed on the chamber bottom. Outlets were provided for

Table 2. Efficiency of heat and formaldehyde in sterilizing contaminated mattresses

Formalin <sup>1</sup>	Test temperature and exposure time	Chamber location of culture	Survival following exposure				
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		Middle front.....	0	0	0	+	0
		Bottom back.....	0	0	0	+	+
		Inside innerspring mattress.....	0	0	0	+	+
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		Bottom back.....	0	0	0	+	0
		Inside innerspring mattress.....	0	+	0	+	0
		Inside innerspring mattress.....	+	+	+	+	0

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+ =Growth of test culture after subculturing and incubation.

until the desired test temperature, as recorded with a thermocouple unit, was reached inside the zippered spring mattress section. The exposure period was calculated from this point. Temperatures and exposure periods ranging from 230° F. for 2 hours to 270° F. for 1 hour were studied in these tests.

### *Dry Heat and Formaldehyde*

In these studies, untreated, used cotton-felt and spring mattresses were suspended vertically from the mattress rack. Thermocouples and envelopes containing test culture strips were placed inside and on the mattress surfaces. The rack was then transferred to an electrically heated chamber, which was also equipped with a fan for circulating the air. Gaseous formaldehyde was generated by heating a liquid so-

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To ascertain the formaldehyde concentration during the exposure periods, air samples were collected from the chamber at various intervals during the exposure period. Gas washing bottles, containing fritted glass disks and 100 ml. of 5 percent sodium bisulfite, were used to collect the chamber air from sampling ports located on one side of the chamber near the top, in the middle, and just above the chamber floor. The samples, collected at a rate of 8 liters per minute for 10 minutes, were analyzed for formaldehyde by the sulfoxylate method (8).

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	Top back.....	0	0	0	0	0
	Bottom back.....	0	0	0	+	0
	Middle center.....	0	0	0	+	0
	Inside innerspring mattress.....	0	0	0	+	+
	Inside cotton-felt mattress.....	0	0	0	+	+
270° F.—1 hour	Top front.....	0	0	0	0	0
	Top back.....	0	0	0	0	0
	Bottom back.....	0	0	0	0	0
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		Bottom back.....	0	0	0	+	0
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Test temperature and exposure time	Chamber location of culture	Survival following exposure				
		<i>S. aureus</i>	<i>E. coli</i>	<i>Myco. phlei</i>	<i>B. globigii</i>	<i>A. niger</i>
230° F.—2 hours-----	Top front.....	0	0	0	0	0
	Top back.....	0	0	0	0	0
	Bottom back.....	0	0	0	+	0
	Middle center.....	0	0	0	+	0
	Inside innerspring mattress.....	0	0	0	+	0
	Inside cotton-felt mattress.....	+	+	+	+	+
250° F.—1 hour-----	Top front.....	0	0	0	0	0
	Top back.....	0	0	0	0	0
	Bottom back.....	0	0	0	+	0
	Middle center.....	0	0	0	+	0
	Inside innerspring mattress.....	0	0	0	+	0
	Inside cotton-felt mattress.....	0	0	0	+	+
250° F.—2 hours-----	Top front.....	0	0	0	+	0
	Top back.....	0	0	0	+	0
	Bottom back.....	0	0	0	+	0
	Middle center.....	0	0	0	+	0
	Inside innerspring mattress.....	0	0	0	+	0
	Inside cotton-felt mattress.....	0	0	0	+	0
270° F.—½ hour-----	Top front.....	0	0	0	0	0
	Top back.....	0	0	0	0	0
	Bottom back.....	0	0	0	+	0
	Middle center.....	0	0	0	+	0
	Inside innerspring mattress.....	0	0	0	+	+
	Inside cotton-felt mattress.....	0	0	0	+	+
270° F.—1 hour-----	Top front.....	0	0	0	0	0
	Top back.....	0	0	0	0	0
	Bottom back.....	0	0	0	0	0
	Middle center.....	0	0	0	+	0
	Inside innerspring mattress.....	0	0	0	+	0
	Inside cotton-felt mattress.....	0	0	0	+	0

0=No growth after subculturing and incubation for at least 1 week.  
+=Growth after subculturing and incubation for at least 1 week.

The experimental commercial chambers for the study were made available by James Miller, Fred Franke Co., Louisville, Ky. and Otis Auer, Docona Associates, Glen Ridge, N. J. Technical assistance in gas sampling and analysis and in the development of operational procedures was given by H. G. Porter and Bruce Turney, Indiana State Board of Health, Indianapolis, Ind. and John Perkins of the American Sterilizer Co., Erie, Pa.

### Laboratory Investigations

Because of the increased use of foam rubber in bedding materials, laboratory tests were made to determine the physical effects of steam under pressure (248° F. at 15 pounds per square

inch), dry heat (230° F.), and heat and formaldehyde in a humid atmosphere on foam rubber. Cored and uncored foam rubber samples, wrapped in mattress ticking, were employed in these tests. Unwrapped samples were also used for comparative purposes. Culture strips, containing the test organisms, were inserted in the samples to determine the bactericidal efficiency of formaldehyde and heat under moist conditions.

A standard laboratory hot air oven and an autoclave were employed in the heat and steam under pressure studies. The formaldehyde tests were conducted in a 1.5 cubic foot laboratory chamber in which liquid formaldehyde was vaporized from a shallow dish placed on the chamber bottom. Outlets were provided for

Table 2. Efficiency of heat and formaldehyde in sterilizing contaminated mattresses

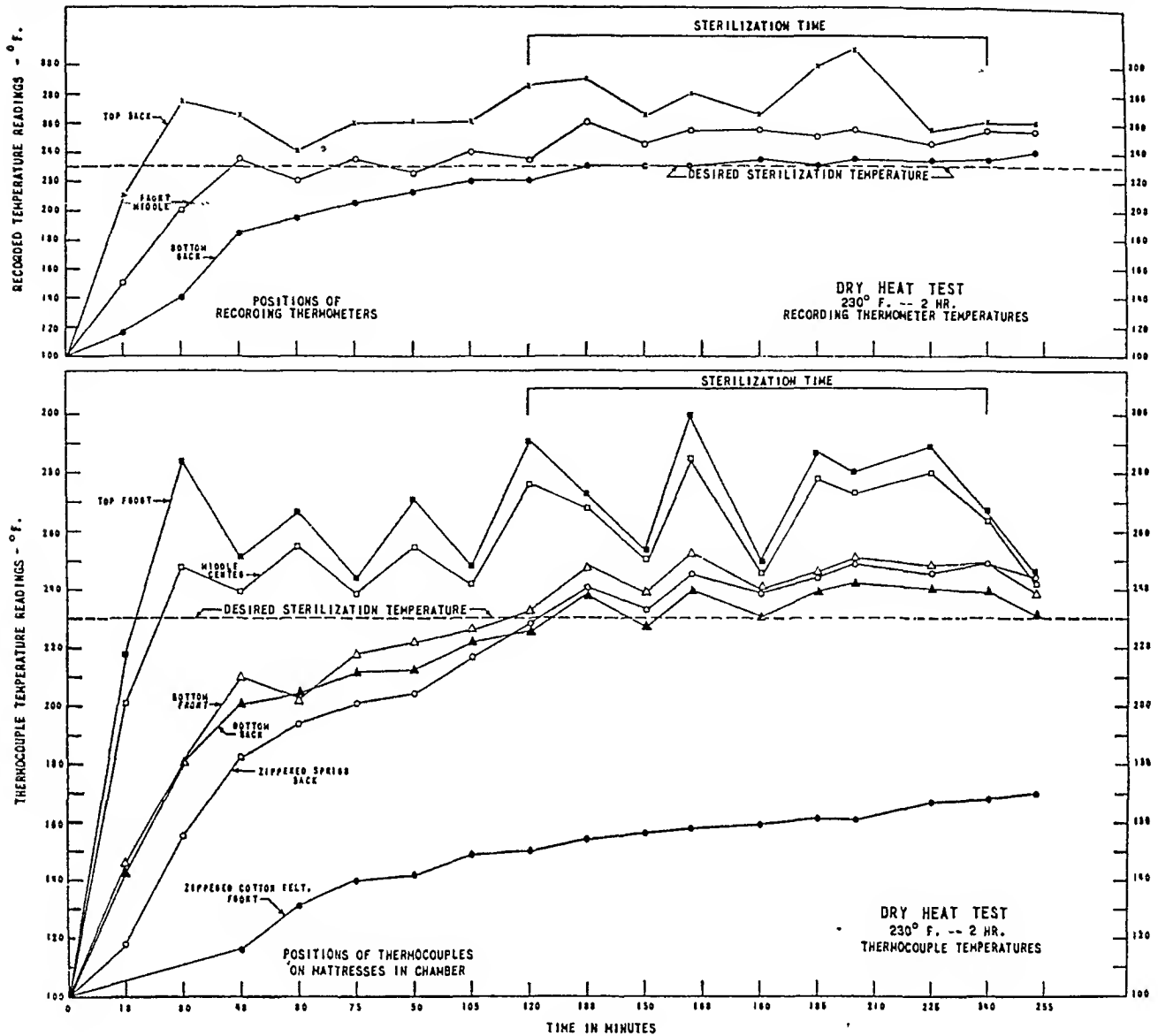
Formalin <sup>1</sup>	Test temperature and exposure time	Chamber location of culture	Survival following exposure				
			<i>S. aureus</i>	<i>E. coli</i>	<i>Myco. phlei</i>	<i>B. globigii</i>	<i>A. niger</i>
1 pint per 1,000 cubic feet. 6 ounces per 300 cubic feet.	230° F.—1¼ hours.	Top front.....	0	0	0	+	0
		Middle center.....	0	0	0	+	0
		Middle front.....	0	0	0	+	0
		Bottom back.....	0	0	0	+	+
		Inside innerspring mattress.....	0	0	0	+	+
		Inside innerspring mattress.....	0	+	+	+	+
1 pint per 1,000 cubic feet. 6 ounces per 300 cubic feet.	230° F.—2¼ hours.	Top front.....	0	0	0	+	0
		Middle center.....	0	0	0	+	0
		Middle front.....	0	0	0	+	0
		Bottom back.....	0	0	0	+	0
		Inside innerspring mattress.....	0	+	0	+	0
		Inside innerspring mattress.....	0	0	0	+	+
1 quart per 1,000 cubic feet. 10 ounces per 300 cubic feet.	230° F.—2¼ hours.	Top front.....	0	0	0	+	0
		Middle center.....	0	0	0	+	0
		Middle front.....	0	0	0	+	0
		Bottom back.....	0	0	0	+	0
		Inside innerspring mattress.....	0	0	0	+	0
		Inside innerspring mattress.....	+	+	+	+	0
1 pint per 1,000 cubic feet. 6 ounces per 300 cubic feet.	250° F.—1¼ hours.	Top front.....	0	0	0	+	0
		Middle center.....	0	0	0	+	0
		Middle front.....	0	0	0	+	0
		Bottom back.....	+	+	0	+	0
		Inside innerspring mattress.....	+	0	0	+	0
		Inside innerspring mattress.....	+	0	0	+	0
1 quart per 1,000 cubic feet. 10 ounces per 300 cubic feet.	250° F.—1¼ hours.	Top front.....	0	0	0	+	0
		Middle center.....	0	0	0	+	0
		Middle front.....	0	0	0	+	0
		Bottom back.....	0	0	0	+	0
		Inside innerspring mattress.....	0	+	0	+	0
		Inside innerspring mattress.....	+	+	+	+	0

<sup>1</sup> See reference 2.

0=No growth after subculturing and incubation for at least 1 week.

+ =Growth of test culture after subculturing and incubation.

Figure 3. Representative temperatures obtained by dry heat in the sterilization of mattresses.



temperature measurements, air sampling, and internal pressure readings. The air samples, collected at 2 liters per minute for 3 minutes through fritted disk gas washing bottles containing 5 percent sodium bisulfite, were analyzed for formaldehyde by the method previously indicated.

## Results

**Dry Heat.** Results of the commercial sterilization of bedding by dry heat are shown in table 1. Spores of *B. globigii* survived exposures of 230° F. to 270° F. for 1 to 2 hours except when the culture strips were located on

the mattress surface near the top of the chamber. Nonsporulating cultures placed on mattress surfaces were destroyed under the test conditions. All cultures placed inside the cotton-felt mattress survived exposure at 230° F. for 2 hours.

Representative temperature data illustrate the elevation of temperatures at various locations in the chamber and in the mattresses (fig. 3). Temperatures of the chamber air and surface temperatures of mattresses placed near the top and in the middle of the rack increased rapidly to about 300° F. during the initial heating of the chamber. Surfaces of mattresses placed near the bottom of the rack required approxi-

mately 2 hours to reach the desired test temperatures. The desired test temperatures were never attained inside the cotton-felt mattresses exposed in the conducted tests.

No physicochemical tests were conducted to determine the effects of dry heat on exposed mattresses. Scorching was visible on the ticking of mattresses located near the top of the chamber where temperature readings ranged from 280° F. to over 300° F., which in most cases were considerably above the desired test temperatures. This indicated an uneven distribution of heat within the chamber during the exposure period.

*Dry Heat and Formaldehyde.* Spores of *B. globigii* survived in all the tests (table 2). The nonsporulating organisms were killed in all but one test when located on mattress surfaces but survived in some instances when placed inside spring mattresses.

Formaldehyde concentrations of the chamber air ranged from 30 to 90 mg. per cubic foot. Temperature readings during these studies were essentially the same as those shown in figure 3.

*Results of Foam Rubber Tests.* Discoloration, hardening and loss of elasticity and tensile strength were found in the foam rubber samples subjected to steam under pressure for a total of 3 hours or to dry heat at 230° F. for a total of 11 hours. Discoloration, brittleness, and drying of the mattress ticking were also noted.

No adverse effects were found in the foam rubber samples wrapped in mattress ticking and subjected for a total of 85 hours to formaldehyde gas (74 to 566 mg. per cubic foot) and heat (122° F. to 158° F.) at pressures of 0.56 to 4.1 pounds per square inch and at an indicated average of 50 to 90 percent relative humidity. Also no adverse effects were found in unwrapped samples of foam rubber exposed to approximately the same conditions.

Nonsporulating organisms and spores of *A. niger*, placed inside wrapped samples of foam rubber, were killed in 3 hours in the presence of about 440 mg. formaldehyde per cubic foot at 158° F. and an indicated average of 55 to 65 percent relative humidity. *B. globigii* spores survived. All test organisms were killed in 6 hours in the presence of 370 to 375 mg. formaldehyde at the same temperatures and relative

humidity. The efficacy of formaldehyde in a heated, moist atmosphere currently is being studied in a gas-tight commercial, mattress sterilizing chamber of approximately 280 cubic foot capacity.

## Summary and Conclusions

Results of an investigation have been presented comparing the efficiencies of dry heat, dry heat and formaldehyde, and formaldehyde in a moist atmosphere in the sterilization of used bedding materials under field and laboratory conditions using *Escherichia coli*, *Staphylococcus aureus*, *Mycobacterium phlei*, and spores of *Bacillus globigii* and *Aspergillus niger*.

Except for the organisms inside cotton-felt mattresses, dry heat at 230° F. for 2 hours in a commercial sterilizing chamber killed all nonsporulating test cultures. Spores of *B. globigii* survived all temperatures and exposure periods tested.

Considerable temperature variations were found in the bedding and in the chambers when the chambers were heated to the desired test temperatures.

The addition of formaldehyde in quantities of 1 pint to 1 quart per 1,000 cubic feet of chamber space did not enhance the sterilizing effects of dry heat alone.

Marked effects were noted in foam rubber when subjected to dry heat at 230° F. and steam under pressure (248° F. at 15 pounds per square inch). No adverse effects were observed when foam rubber was subjected to heat at 122° to 158° F. and formaldehyde in a moist atmosphere. No viable organisms were recovered from artificially contaminated foam rubber exposed to an average of 376 mg. formaldehyde per cubic foot for 6 hours at 149° to 158° F. and an indicated average of 60 to 65 percent moisture.

## REFERENCES

- (1) Sprague, E. K.: Formaldehyde disinfection in a vacuum chamber. Pub. Health Rep. 14: 1549-1559, Sept. 22, 1899.
- (2) Nordgren, G.: Investigations on the sterilization efficacy of gaseous formaldehyde. Acta path. et microbiol. Scandinav. Supp. XL, pp. 38-40 (1938-39).

- (3) Gibbons, E. H.: Disinfection of mattresses. School of Engineering, Texas Engineering Experiment Station Bull. No. 87. College Station, Tex., The School of Engineering, 1945.
- (4) American Standards Association. Subcommittee on Bedding Sterilization: Activity reports of 1951 and 1952. Cincinnati, Ohio, Robert A. Taft Sanitary Engineering Center, May and December 1952.
- (5) Phillips, C. and Kaye, S.: The sterilization action of gaseous ethylene oxide. II. Sterilization of contaminated objects with ethylene oxide and

related compounds. *Am. J. Hyg.* 50: 280-288, November 1949.

- (6) Kolb, R. W. and Schneider, R.: The germicidal and sporicidal efficiency of methyl bromide for *Bacillus anthracis*. *J. Bact.* 59: 401-412, March 1950.
- (7) Jungherr, E.: Studies on sanitizing used feed bags. *J. A. V. M. A.* 117: 324-328, October 1950.
- (8) Goldman, F. H., and Yagoda, E.: Collection and estimation of traces of formaldehyde in air. *Indust. & Engin. Chem. (Anal. Ed.)* 15: 377-378, June 1943.

## technical publications

### Directory of Full-Time Local Health Units, 1954

*Public Health Service Publication No. 118. Revised 1954. 58 pages. 25 cents.*

Revised July 1954, this directory brings up to date the listing of full-time health units serving local areas, together with the name of the health officer, or other designated administrative head, of each unit. The local units are listed by State, giving in each instance the health area jurisdiction, the post office address, and the health officer's name and his official title.

### When the Migrant Families Come Again

**A Guide for Better Community Living**

*Federal Interdepartmental Committee on Children and Youth publication. 1955. 27 pages; illustrated. 15 cents.*

Addressed primarily to citizens in communities where there is a large annual influx of migratory farm and food processing workers, this pamphlet offers suggestions for building community programs to offer to the migrant worker and his family the basic things available to the average family—housing, good food,

churches, schools, recreation facilities, and store services. It describes what some community groups have done to help meet the health, education, and welfare problems arising during the season the migratory workers and their families are in the areas. Health agency personnel and community leaders will find in the pamphlet information to stimulate program planning to fit their community's specific needs.

### The Clinical Center

**Current Studies and Patient Referral Procedures**

*Public Health Service Publication No. 284. Revised 1954. 24 pages. 10 cents.*

Useful primarily to physicians, this leaflet describes briefly the principal research projects to which patients are currently being admitted for study and therapy at the Clinical Center of the National Institutes of Health, Bethesda, Md. The procedure for referral of patients and the eligibility requirements are also explained.

The Clinical Center is a modern facility shared by all seven of the institutes of health concerned with basic laboratory investigations and research in the fields of cancer, cardiovascular disease, mental health, neurological diseases and

blindness, arthritis and metabolic diseases, microbiology, and dental health.

### National Institutes of Health Annual Lectures, 1953

*Public Health Service Publication No. 388. 1954. 102 pages. 45 cents.*

Five lectures delivered in 1953 at the National Institutes of Health, Bethesda, Md., are published in this booklet: Tricarboxylic Acid Cycle—Enzymatic Mechanisms, by Seyero Ochoa; Philosophy of the Clinical Trial, by A. Bradford Hill; Changes in the Vulnerability of Tissue—An Aspect of Man's Response to Threat, by Harold G. Wolff; Regulation of ACTH Secretion, by C. N. H. Long; and The Gold-Headed Cane in the Laboratory (the third R. E. Dyer lecture), by René J. Dubos.

This section carries announcements of all new Public Health Service publications and of selected new publications on health topics prepared by other Federal Government agencies.

Publications for which prices are quoted are for sale by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. Orders should be accompanied by cash, check, or money order and should fully identify the publication. Public Health Service publications which do not carry price quotations, as well as single sample copies of those for which prices are shown, can be obtained without charge from the Public Inquiries Branch, Public Health Service, Washington 25, D. C.

The Public Health Service does not supply publications issued by other agencies.



| *Studies of bacteria with acquired resistance to drugs throw light on the mechanism of the resistance phenomenon.*

# Genetic Basis of Acquired Drug Resistance

By M. DEMEREC, Ph.D.

UNTIL a very few years ago many biologists still questioned whether the hereditary mechanism that had been so effectively analyzed in *Drosophila*, maize, *Datura*, and mice, and found to apply to all the higher organisms, was also operative in lower organisms. Bacteriologists in particular were highly skeptical on this subject, probably because they considered it unlikely that such a simple mechanism, if it existed in bacteria, could have escaped detection in the course of their extensive physiological and clinical studies.

Within the past decade, however, there has been a striking change in the thinking of scientists about heredity in micro-organisms. About 10 years ago geneticists started to work with these organisms, and they developed for their

research special methods utilizing a broad background of information derived from studies of higher organisms. Their results have been spectacular.

Hershey (1) and Delbrück and Bailey (2) in 1946 found that crosses could readily be made between bacterial viruses (bacteriophages), and experiments by Visconti and Delbrück (3) in 1953 indicated that the transmission of paternal characteristics to the offspring of such crosses is in accordance with expectation based on Mendel's law. These findings mean that the basic genetic mechanism operating in the lowest and smallest of known living beings is similar to that operating in the higher organisms, and they suggest that the fundamental laws of heredity are general and apply to all life. They do not necessarily mean that the mechanism of heredity must be identical in all details throughout the living world, nor, in particular, that chromosomes, which have been established as the carriers of the determiners of heredity (genes) in higher organisms, must be present in the same form in all organisms. Indeed, we have good reason to believe that such chromosomes do not exist in bacterial viruses. It does seem very probable, however, that the basic threadlike structure of the chromosome, the chromonema, is similar in all organisms, but that the envelope surrounding the chromonemata may be absent in the lowest organisms, such as viruses, and present in a different form in some others.

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*Dr. Demerec is director of the department of genetics, Carnegie Institution of Washington, and director of the biological laboratory, Long Island Biological Association, in Cold Spring Harbor, N. Y. Numerous reports of his research dealing with studies of gene structure and gene mutations have appeared in the literature. This paper was delivered at a symposium on the nature of acquired microbial resistance to drugs, which was organized by the American Society for Pharmacology and Experimental Therapeutics, at the 39th annual meeting of the Federation of American Societies for Experimental Biology in San Francisco, April 14, 1955.*

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Whereas a single chromonema is extremely slender and very probably below the level of optical visibility, the envelope makes up the bulk of a chromosome and is responsible for its characteristic appearance as observed at certain stages in dividing cells.

The discovery that bacterial viruses possess a genetic mechanism similar to that operating in higher organisms would in itself have justified the assumption that such a mechanism is present also in bacteria, for it would be remarkable, indeed, if bacteria were set apart in a class by themselves as far as heredity is concerned. In addition to this indirect evidence, however, there is a considerable body of direct evidence about the genetic mechanism in bacteria, proceeding especially from the genetical work of Lederberg and his collaborators, and from cytological studies by Robinow (4) and DeLamater (5). Thus, we are now able to say with a fairly high degree of certainty that bacteria are not essentially different from other organisms with respect to the genetic mechanism, that is, that they possess genes and chromosomes.

In the early days of genetics, and in some quarters even recently, the opinion prevailed that biologically unimportant characteristics, such as body color, shape of various organs, and the presence or absence of hairs and bristles, were determined by genes, whereas biologically important and fundamental properties, such as taxonomic differences, fertility, and the functions governing development, were determined by some other, unidentified mechanism. But with the progress of genetic research the number of such "fundamental" properties that can be supposed to depend on some extragenic mechanism has rapidly decreased, and at present there is ample evidence to indicate that genes play a major role in the transmission of almost all hereditary traits.

For example, the results of early studies by Ephrussi and his collaborators indicated that cytoplasmic constituents were responsible for the inheritance of a "petite" colony type in yeast, but later these workers were able to show by ingenious tests that genes also play a decisive role. In this yeast, treatment with ouabain suppresses synthesis of the enzyme, cytochrome oxydase, by eliminating from the

cells the specific cytoplasmic components (mitochondria) that presumably produce the enzyme. The rate of multiplication of such cells is affected so that they form small colonies rather than colonies of normal size; and this pattern of growth is transmitted to the offspring. Thus, the character appears to be determined by the cytoplasmic units, mitochondria. Crosses made between these small-color cells and normal cells from another strain of yeast, however, showed that the synthesis of respiratory enzymes requires the simultaneous presence of a cytoplasmic factor and a dominant nuclear gene. The cytoplasmic factor appears to be dependent on the nucleus in its function although independent of it in its reproduction (6).

### Origin of Resistance

With this brief introduction, in which I have stressed the likelihood that the same kind of genetic mechanism operates in all living organisms and that it plays an important role in the hereditary transmission of almost all characteristics, I shall now take up the problem of the genetic basis of acquired drug resistance. The following are well-established facts: (a) Bacterial strains more resistant to a certain drug than the original strain can be isolated, sometimes with great ease; (b) the degree of resistance may vary from slight to complete; (c) as a rule, the resistance is retained through a large number of transfers; and (d), again as a rule, the degree of resistance is not affected by further transfers. Thus, it is demonstrated that bacteria of such resistant strains have acquired a new property, which they transmit to their offspring, in other words, that we are dealing with a heritable characteristic.

With this information available, a geneticist would assume a priori that changes in genes—that is, mutations—are responsible for the origin of resistances, since it seems very improbable that some other mechanism could account for such a clear-cut and comprehensive class of properties. Substantial grounds for this assumption have been provided by experimentation carried out in several laboratories. The combined results have shown clearly: (a) that resistance is not induced by the presence

drug but appears spontaneously, as one would expect if it is caused by gene mutation (7-14); (b) that crosses made in studies of resistance to streptomycin (15-18), chloramphenicol (19, 20), azide (21), terramycin (12), and furadroxyl (Nelson, quoted in reference 22) have given rise to Mendelian segregation and linkage, as expected in genic inheritance; (c) that in transduction experiments streptomycin resistance is transferred in the same manner as other genic characters (23); and finally (d) that in transformation experiments both penicillin resistance and streptomycin resistance are transferred like other genic characters (24-26). Thus, in manner of origin and in behavior in crosses, transduction, and transformation, the characters conferring bacterial resistance to drugs conform to the type of reaction usually observed in studies of gene-determined traits.

Within the past decade another important aspect of genic reaction has been explored. It has been found that not only radiations but also a considerable number of chemical compounds are able to induce mutations in genes, and—the significant point for our consideration here—that in every known instance the effect has been nonspecific; that is, in no case studied so far has a chemical been able to induce mutations only in a certain gene or only in genes affecting one particular property. Therefore, again, it would be very surprising indeed to find that treatment of bacteria with a drug had a specific effect on the gene or genes determining their sensitivity to that drug—a postulate implied by those who claim that bacterial resistance to a drug is induced by the drug itself. Fortunately, no such assumption is necessary to account for the observed fact that resistant bacteria invariably appear after exposure of cells to certain concentrations of a drug. This result is to be expected under circumstances that are well known to students of population genetics, namely, when a strong selection pressure acts on a large, nonhomogeneous population in which many genotypes are represented. A bacterial culture or a bacterial infection is just such a population. Since bacterial cells are very small, a tremendous number of individuals can be present in a relatively small volume. For example, 1 cubic millimeter would hold about  $10^9$  (a billion) cells of *Escherichia coli*. From

what is known about the frequency with which spontaneous mutations to drug resistance occur, it is to be expected that a population of that size would include mutants representing almost all the genes instrumental in resistance, and consequently that some bacteria resistant to any particular drug would be present. Treatment with a drug, then, would inhibit or eliminate the large body of sensitive individuals and thus would make it possible for the few resistant bacteria to multiply freely and produce a strain resistant to the drug used in treatment.

### Patterns of Resistance

Studies of resistance to different drugs have shown that in the great majority of cases a high degree of resistance is attained only "stepwise," that is, through the occurrence of several consecutive mutations. From a sensitive strain we can isolate a mutant strain that is only slightly resistant (first-step resistance); another mutation occurring in such a strain will produce an increased degree of resistance (second-step resistance); and so on. With a few drugs, however, it is possible for some first-step mutants to possess a high degree of resistance. Thus, effective resistance either may be built up in several steps, or it may be attained through a single mutational event. The stepwise pattern of resistance development has been called the penicillin pattern, and the single-step pattern, the streptomycin pattern, after the drugs first used in analyzing the patterns (8). It is interesting to note that, as a rule, the resistance pattern is specific for the drug, in other words, that the origin of resistance to a certain drug follows the same pattern in all strains and species of bacteria.

Pattern of resistance has a very important bearing on the effectiveness with which physicians can avoid the development of highly resistant strains in clinical practice. The use of drug concentrations high enough to eliminate all first-step resistant organisms will preclude the buildup of high resistance where the stepwise pattern of origin is concerned, but no single treatment will be effective in preventing the origin of highly resistant individuals when one is dealing with the single-step pattern. Fortunately, only a small number of known drugs

elicit this single-step pattern of resistance—streptomycin, isoniazid, sodium *p*-aminosalicylate (PAS), erythromycin, and cinnamycin (27); all others are associated with the stepwise pattern.

Theoretically, it should be possible to avoid the development of strains resistant to the single-step pattern drugs by administering these drugs in combination with other drugs which act independently of them. In dealing with the stepwise pattern, also, the clinical use of combinations of drugs should still further reduce the chances for development of resistance. The reasoning on which this expectation is based can be outlined as follows. If the frequency of origin of mutant bacteria resistant to either drug A or drug B is 1 per 10 million ( $1 \times 10^{-7}$ ), and if mutants resistant to drug A are sensitive to drug B and vice versa, then the expected frequency of bacteria carrying both resistances is 1 per  $10^{14}$ . Since only "double" mutants of this kind could survive appropriate treatment with a combination of drugs A and B, and thus become the progenitors of a resistant strain, the chance that resistant strains will develop is tremendously smaller when a combination of drugs is used in treatment than when a single drug is used. Laboratory experiments, the results of which are consistent with this theoretical expectation, have been reported by Szybalski and Bryson (28).

In clinical application of drugs, however, other factors than resistance may play a role in the survival of bacteria. Some cells may survive because they are located where they cannot be reached by a full concentration of the drug; others may be in a physiological state that confers a temporary immunity to its action. Under certain circumstances these factors may favor the selection of resistant mutants and result in the development of resistant strains in spite of treatment that theoretically should prevent such development.

In the present discussion I have emphasized the genetic mechanisms that participate in the origin of bacterial resistance to various drugs and have omitted any consideration of complicating factors, such as synergism, cytoplasmic constituents, and physiological aspects. A full discussion of these problems has been ably

presented in a comprehensive review by Bryson and Szybalski (27).

#### REFERENCES

- (1) Hershey, A. D.: Spontaneous mutations in bacterial viruses. *In* Cold Spring Harbor symposia on quantitative biology. Cold Spring Harbor, N. Y., Biological Laboratory, 1946, vol. 11, pp. 67-77.
- (2) Delbrück, M., and Bailey, W. T., Jr.: Induced mutations in bacterial viruses. *In* Cold Spring Harbor symposia on quantitative biology. Cold Spring Harbor, N. Y., Biological Laboratory, 1946, vol. 11, pp. 33-37.
- (3) Visconti, N., and Delbrück, M.: The mechanism of genetic recombination in phage. *Genetics* 38: 5-33, January 1953.
- (4) Robinow, C. F.: A study in the nuclear apparatus of bacteria. *Proc. Roy. Soc., series B, Biol. Sc., London* 130: 299-324 (1942).
- (5) DeLamater, E. D.: A new cytological basis for bacterial genetics. *In* Cold Spring Harbor symposia on quantitative biology. Cold Spring Harbor, N. Y., Biological Laboratory, 1951, vol. 16, pp. 381-412.
- (6) Ephrussi, E.: *Nucleo-cytoplasmic relations in micro-organisms*. Oxford, England, Clarendon Press, 1953.
- (7) Demerec, M.: Production of staphylococcus strains resistant to various concentrations of penicillin. *Proc. U. S. Nat. Acad. Sc.* 31: 16-24 (1945).
- (8) Demerec, M.: Origin of bacterial resistance to antibiotics. *J. Bact.* 56: 63-74, July 1948.
- (9) Oakberg, E. F., and Luria, S. E.: Mutations to sulfonamide resistance in *Staphylococcus aureus*. *Genetics* 32: 249-261, May 1947.
- (10) Newcombe, H. B.: Origin of bacterial variants. *Nature, London* 164: 150-151, July 1949.
- (11) Newcombe, H. B., and Hawirko, R.: Spontaneous mutations to streptomycin resistance and dependence in *E. coli*. *J. Bact.* 57: 565-572, May 1949.
- (12) Cavalli, L. L.: Genetic analysis of drug-resistance. *Bull. World Health Org.* 6: 185-206 (1952).
- (13) Lederberg, J., and Lederberg, E. M.: Replica plating and indirect selection of bacterial mutations. *J. Bact.* 63: 399-406, March 1952.
- (14) Mitchison, D. A.: The occurrence of independent mutations to different types of streptomycin resistance in *Bacterium coli*. *J. Gen. Microbiol., London* 8: 168-185, February 1953.
- (15) Demerec, M.: Reaction of populations of unicellular organisms to extreme changes in environment. *Am. Naturalist* 84: 5-16 (1950).
- (16) Newcombe, H. B., and Nyholm, M. H.: The inheritance of streptomycin resistance and dependence in crosses of *Escherichia coli*. *Genetics* 35: 603-611, November 1950.
- (17) Lederberg, J.: Streptomycin resistance: A ge-

- netically recessive mutation. *J. Bact.* 61: 549-550, May 1951.
- (18) Fried, P. S., and Lederberg, J.: Linkage in *E. coli* K-12 (abstract). *Genetics* 37: 582, September 1952.
  - (19) Cavalli, L. L., and Maccacaro, G. A.: Chloromycetin resistance in *E. coli*. A case of quantitative inheritance in bacteria. *Nature, London* 166: 991-993, Dec. 9, 1950.
  - (20) Cavalli, L. L., and Maccacaro, G. A.: Polygenic inheritance of drug-resistance in the bacterium *Escherichia coli*. *Heredity* 6: 311-331, December 1952.
  - (21) Lederberg, J.: The selection of genetic recombinations with bacterial growth inhibitors. *J. Bact.* 59: 211-215, February 1950.
  - (22) Cavalli-Sforza, L. L., and Lederberg, J.: Genetics of resistance to bacterial inhibitors. In *Proc., 6th International Congress of Microbiology, Rome, Paterno, 1953, vol. [4], pp. 108-142.*
  - (23) Zinder, N. D., and Lederberg, J.: Genetic exchange in *Salmonella*. *J. Bact.* 64: 679-699, November 1952.
  - (24) Hotchkiss, R. D.: Transfer of penicillin resistance in pneumococci by the desoxyribonucleate derived from resistant cultures. In *Cold Spring Harbor symposia on quantitative biology. Cold Spring Harbor, N. Y., Biological Laboratory, 1951, vol. 16, pp. 457-461.*
  - (25) Alexander, H. E., and Leidy, G.: Induction of streptomycin resistance in sensitive *Hemophilus influenzae* by extracts containing desoxyribonucleic acid from resistant *Hemophilus influenzae*. *J. Exper. Med.* 97: 17-31, January 1953.
  - (26) Hotchkiss, R. D., and Marmur, J.: Double marker transformations as evidence of linked factors in desoxyribonucleate transforming agents. *Proc., U. S. Nat. Acad. Sc.* 40: 55-60 (1954).
  - (27) Bryson, V., and Szybalski, W.: Microbial drug resistance. *Advances in genetics.* In press.
  - (28) Szybalski, W., and Bryson, V.: One step resistance development to isoniazid and sodium-p-aminosalicylate. *J. Bact.* 66: 468-469, October 1953.

## Trichophyton tonsurans Ringworm Spreading

A northeastern Michigan outbreak of ringworm infection caused by *Trichophyton tonsurans* was reported in the *Journal of the Michigan State Medical Society*, June 1955, pp. 687-690 and 727, by Eugene A. Hand, M.D., Saginaw, Mich., and Lucille K. Georg, Ph.D., Public Health Service mycologist.

The disease, previously almost unknown in the area, was reported endemic in both rural and urban sections of Michigan where there is a growing community of persons who have come from endemic areas in Mexico.

The Michigan outbreak is indicative of the spread of the disease on the North American continent, according to the Mycology Unit of the Public Health Service Communicable Disease Center.

Within the past 6 to 8 years, *T. tonsurans* infections of the scalp, glabrous skin, and nails have become endemic in New York and in the southwestern States, especially in Texas and southern California. Scattered cases have been reported from 13 States and Canada. Ringworm infections caused by this endothrix fungus have been common in Mexico and Puerto Rico for many years, whereas *Microsporum audouinii*, the common agent of ringworm of the scalp in the United States, is rare in those countries.

Public Health Service mycologists foresee the possibility that *T. tonsurans* ringworm may constitute a health problem in the United States similar to epidemic ringworm caused by *M. audouinii*. They point out, however, that the problem will be more difficult because the infections occur in both children and adults. The infections are harder to detect and usually are more refractory to treatment. Roentgen ray epilation is considered the treatment of choice.

The problem of *T. tonsurans* ringworm was previously presented in detail in *Public Health Reports*, January 1952, pp. 53-56.

*State and Territorial immunization policies contain both useful variations and needless and confusing differences. Agreement on standards is advocated.*

# Variations in State Immunization Policies

By JOHAN W. ELIOT, M.D.

THE planning of a revision of immunization policies by the Arkansas State Board of Health in 1954 prompted a comparison of Arkansas' policies with those of the other States. Each State and Territory was therefore requested to furnish its current immunization policies to the Arkansas State Board of Health. Very helpful replies were received from all States.

Some of the States submitted their current policy statements with the understanding that revision was in process or planned. The District of Columbia and Washington preferred to wait until their revisions were completed before submitting material. Information on the two is therefore not tabulated.

Nine States, two Territories, and the District of Columbia are currently revising or planning revision of their immunization policies, and 15 States and 1 Territory have revised their policies within the past 2 years (table 1). Older policies are not necessarily out of date, as, for example, Oregon's thoughtful and thorough manual of 1950.

An increasing number of States are making

use of the Report of the Committee on Immunization and Therapeutic Procedures for Acute Infectious Diseases of the American Academy of Pediatrics (1). Eighteen States and three Territories used this report either in whole or in part, or are making it a basis for forthcoming revisions (fig. 1).

## Compulsory Immunization Policies and Laws

The degree to which immunization policies constitute general recommendations to physicians or local health units, or specific regulations, vary and is not easy to determine in many cases. On one extreme Indiana, Maine, Ohio, Virginia, and Wyoming simply endorse the American Academy of Pediatrics report (1) for general use. On the other extreme Arkansas, Kentucky, Louisiana, Mississippi, Montana, North Carolina, North Dakota, Oklahoma, South Dakota, Tennessee, Texas, and West Virginia, in which a large number of immunizations are handled by public health personnel, have more definite policies. Alaska has made a major effort to set definite immunization policies because itinerant public health nurses must, at times, carry on their work far from any medical supervision. Puerto Rico has made a similar effort.

Hawaii seems to have the most specific and extensive compulsory immunization laws of any State or Territory. Hawaii legally requires

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universal inoculation against diphtheria, typhoid fever, and smallpox.

Six other States and one Territory were noted to have certain immunizations which are or could be required, or which have to be made available, by law. Arkansas requires smallpox vaccination by law before school entry. In Maine, each city, town, or plantation must provide free smallpox vaccination to all, and free diphtheria and pertussis immunizations to all children under age 12 annually. In New Jersey local boards of education are empowered to require diphtheria and smallpox immunizations before school entry if they deem these necessary. New Mexico requires smallpox vaccination for school children. North Carolina law requires that diphtheria and pertussis immunizations be given to all infants before they are a year old, although there is no indication of how this is to be carried out. West Virginia law requires all children to be immunized against smallpox and diphtheria, before or at the time of school entry, by private physician, county health department, or physicians specially appointed by county courts or municipal councils. Puerto Rico makes smallpox vaccination compulsory for all citizens.

### Preschool DTP Immunization

The minimum age at which combined diphtheria-tetanus-pertussis antigens (DTP) may be started is 1 month in 4 States and 6 weeks in Mississippi (table 1 and fig. 2). The minimum age is 2 months in 19 States and Alaska. Five of the latter States simply endorse the 1952 American Academy of Pediatrics report, which says, "There is no objection to beginning immunization in the second month of life." Several States recommend that a total of four DTP injections be given if they are started at age 2 months. The minimum age for starting DTP injections is 3 months in 14 States and 2 Territories, and 4 months in 2 States and 1 Territory. Rhode Island recommends starting the vaccinations at 6 months. Four States do not specify a minimum age. North Carolina and Oklahoma do not supply the combined vaccine, but recommend starting pertussis vaccine at age 2 months and diphtheria toxoid at 6 months.

The maximum permissible interval between

injections in the primary DTP series varies a good deal (fig. 3). In 22 States and 1 Territory the interval is stated as 1 month, with no flexibility either way. Mississippi permits 5 weeks to elapse and 5 States allow 6 weeks. Two States and two Territories permit up to 3 months between injections, and three States permit a 4-month period. Up to 6 months is allowed between injections without asking that the series be started over in 8 States and 1 Territory, including those States which simply endorse the American Academy of Pediatrics report. A few States make no recommendation regarding this interval. Two States have continued with separate antigens. Oklahoma recommends a 1-month interval for each antigen, and North Carolina makes no recommendation as to interval.

The recommended age for giving the first DTP booster dose is fairly uniform in 35 States, Alaska, and the Virgin Islands. The age is stated as about 15 to 24 months or simply about 1 year after completion of the primary series (table 1). A few States recommend a shorter interval, varying between 4 and 10 months, before the first booster dose. Other States recommend that the first booster dose be given between ages 2 to 6. Rhode Island gives no routine DTP booster, but gives the series over if the child is Schick positive in the first grade. Most States advocate a DTP booster injection shortly before or at the time of entering school, although five preferred to omit the pertussis antigen after ages 2 to 4. Twenty-one States and four Territories feel it desirable to intersperse another booster dose between the first booster dose and the one at the start of school. Alabama feels that annual booster doses are necessary up to age 5 to maintain immunity to diphtheria.

### DTP Immunization of School Children

There seems to be a fairly definite division between those States which do not continue pertussis immunization into the school years and those which do. Twenty-five States and one Territory make no recommendation of pertussis immunization in the school years. Twenty States and three Territories continue pertussis immunization in the school years. Of



the latter, 15 States and 3 Territories discontinue pertussis immunization after age 10, and 3 continue pertussis immunization in the form of DTP to ages 12 to 14. Two States recommend pertussis immunization to age 8. Colorado and Pennsylvania recommend it on exposure at any age.

Fifteen States and one Territory which do not recommend DTP vaccination in the school years advocate at least one dose of combined diphtheria-tetanus toxoids in this period. Six States permit diphtheria-tetanus toxoids as an alternate to DTP in the school period. Twenty-seven States and three Territories do not mention the use of diphtheria-tetanus toxoids in the school period. Seven States advocate separate diphtheria toxoid during the grammar school years.

Many States warn against the routine use of diphtheria toxoid for children over age 10 because of the increased possibility of bad reactions. However, 14 States have been recommending use of either usual or reduced doses of diphtheria toxoid, separately or as diphtheria-tetanus, through ages 12 to 15 (table 1). Michigan and South Dakota recommend the diphtheria toxoid at this age only for those who are Schick negative. Iowa recommends it only for those who are shown not to be sensitive to the toxoid. Those States which simply follow the American Academy of Pediatrics report presumably support its recommendation of a Schick test done at ages 12 to 14, and another 4 years later, to test immunity and to act as a small stimulating dose to arouse immunity. Vermont advocates repeated Schick tests at monthly intervals until the test becomes negative, if there is a special desire for immunizing a child over age 10 against diphtheria (usually 4 to 6 Schick tests). Rhode Island gives Schick tests to all school children in the first and fifth grades and gives Schick-positive children in the first grade a DTP immunization series or a diphtheria series in fifth grade.

### Adult Diphtheria Immunization

It is evident that a number of States feel that diphtheria immunization can and should be extended to high school students. Twenty-seven States and three Territories also extend

immunization to adults under various special circumstances with preliminary Schick and, sometimes, toxoid sensitivity tests (table 2 and fig. 4).

So long as there were substantial numbers of diphtheria cases and carriers among children, most adults received occasional casual exposure to the disease which served to boost their immunity to it. This concept was expressed in the immunization literature of the Territory of Hawaii. However, numerous studies (2-4) have shown that with the decrease of diphtheria in children, adult populations are increasingly susceptible to the disease, and when the disease has assumed epidemic proportions, a marked shift of incidence into the adult population has been shown.

Seven States have expressed concern over this trend. Massachusetts has engaged in studies, paralleling and coordinated with those of the U. S. Armed Forces, to determine a dosage and type of diphtheria toxoid which can be given safely and effectively to adults without the administrative difficulties associated with the use of Schick and toxoid sensitivity tests.

As a result of these studies, the Massachusetts Department of Public Health, division of biologic laboratories, is now producing a combined fluid diphtheria-tetanus toxoid which contains about one-tenth the amount of diphtheria toxoid contained in the standard diphtheria-tetanus mixtures. This product is being used both for primary immunization and for booster immunization against diphtheria and tetanus in adults. It is similar to, but has even less diphtheria toxoid than, the diphtheria-tetanus toxoids used successfully by the Canadian armed forces for the past several years. The U. S. Armed Forces have developed a precipitated product with similar properties (5). None of these products requires prior Schick or toxoid sensitivity testing. Arkansas plans to utilize the type of material developed by the U. S. Armed Forces for diphtheria immunization in adults.

### Tetanus Immunization Intervals

The importance placed on continued tetanus immunization in older children and adults varies a good deal. Nineteen States and two



Table 1. Summary of DTP immunization policies, United States and Territories

State or Territory	Date of last policy revision	Preschool children			School children		Diphtheria for adults when needed
		Minimum age (in months)	Maximum dose intervals (months)	Age for boosters (years)	Pertussis not included after age	DT recommended in school at age	
Alabama	May 1951	3	1½	1½, 2½, 3½, 4½	6		(1)
Arizona	1954-55 <sup>2</sup>	2		To 2d grade	6	10	
Arkansas	June 1955 <sup>3</sup>	1	6	1½, 5½	6-10	10, 15	(4)
California	1950-1952	3	1	1½, 5	6	10, 15	(1)
Colorado	July 1949	3	1	1½, 5½	8		(1)
Connecticut	Oct. 1954	3	6	1½, 3½, 6, 9	10	10	
Delaware	1952 <sup>3</sup>	4	1	1½, 6, 9	10		
District of Columbia	In revision <sup>5</sup>						
Florida	April 1952	2	1	1-1½, 4-5, 8	6		
Georgia	In revision	3	1	1½, 4-5, 7-8	6		
Idaho	1952 <sup>3</sup>	3	1	1½-2, 6	6	10, 15	
Illinois	Oct. 1954	2	1	1½, 4, 7, 10	10	10, 14	(6)
Indiana	(1952) <sup>3</sup>	2	6	1½, 3, 6	10		(6)
Iowa	Oct. 1952 <sup>3</sup>	2	4	1½, 5	6	10	(7)
Kansas	No date	3	1	1-2, 5-6	6	<sup>8</sup> 7-10	
Kentucky	In revision <sup>3</sup>	2	4	1-1½, 3, 6	6	9, 12	(1)
Louisiana	Nov. 1954 <sup>3</sup>	2	3	1, 2, 6	10		(6)
Maine	(1952) <sup>3</sup>	2	6	1½, 3, 6	10		(6)
Maryland	In revision <sup>3</sup>	4	4	1, 3, 5	10		(6)
Massachusetts	1952, 1954 <sup>3</sup>	2	1½	1½	About 4	6, 11, 15	(4)
Michigan	1952	3	1½	2-3	3	5, 10	
Minnesota	Feb. 1952	3	1	1½-2, 5-6	6	9, 12, 15	(6)
Mississippi	Aug. 1954	1½	1¼	1½-2¼	4	6, 10	
Missouri	No date	2	1	1½, 3-4, 6	6	9-10	
Montana	April 1954	1	1	1½, 4, 7, 10	10		
Nebraska	1948	3	1	1½, 6	6	12	
Nevada	No date <sup>10</sup>		1	About 2, 6	6		
New Hampshire	1952 <sup>3</sup>		1½				(7)
New Jersey	1954			2, 5, 8, 11, 14	12-14		
New Mexico	Aug. 1954 <sup>3</sup>	1	6	1, 4, 6, 8	10		
New York	In revision <sup>3</sup>	3	1	1½, 5	6	10, 15	
North Carolina	do <sup>3</sup>	<sup>8</sup> 6		1, 6 <sup>8</sup>			
North Dakota	do	3		2, 5, 8, 11, 14	12-14	8, 11, 14	(4)
Ohio	(1952) <sup>3</sup>	2	6	1½, 3, 6	10		(6)
Oklahoma	April 1951	<sup>8</sup> 6	<sup>8</sup> 1	3, 6 <sup>8</sup>	6	<sup>8</sup> 12	(4)
Oregon	Dec. 1950	3	3	1½, 5	6	10, 15	(6)
Pennsylvania	In revision	2	1	1, 3-4	4	<sup>8</sup> 7, 11	(1)
Rhode Island	No date	6	1	6 <sup>11</sup>	8	<sup>8</sup> 6, 10	
South Carolina	do	2	1	1½, 3	10	<sup>8</sup> 6, 10	
South Dakota	do		1½	5-6	6	6	(1)
Tennessee	1953 <sup>3</sup>	2	1	1½	About 4	<sup>8</sup> 6	(7)
Texas	1953	2	1	1, 3, 6	6		(7)
Utah	In revision	1	1	1½, 3, 6	6	9, 12	(6)
Vermont	Feb. 1954	2	1	1, 3, 6	6	8, 10	(12)
Virginia	(1952) <sup>3</sup>	2	6	1½, 3, 6	10		(6)
Washington	In revision <sup>5</sup>						
West Virginia	March 1955 <sup>3</sup>	3	1	1, 3½, 6	9-10		(6)
Wisconsin	May 1952	2	1	2-3, 5, 8, 11, 14	12-14		
Wyoming	(1952) <sup>3</sup>	2	6	1½, 3, 6	10		(6)
Alaska	In revision <sup>3</sup>	2	3	1½, 3, 6, 10	10		(6)
Hawaii	Nov. 1954 <sup>3</sup>	3	6	3, 5, 7	10		
Puerto Rico	Jan. 1950	4	1	¾, 2, 5	6	6, 10	(1)
Virgin Islands	In revision <sup>3</sup>	3	3	1½, 3, 7, 10	10		(1)

<sup>1</sup> After Schick test. <sup>2</sup> From State plan. No printed policies. <sup>3</sup> Use or planning to use the American Academy of Pediatrics report, 1952. (Date in parentheses indicates the States that adopted the report in lieu of separate policies.) <sup>4</sup> No Schick or toxoid sensitivity test. <sup>5</sup> Present policies not available. <sup>6</sup> After Schick and toxoid sensitivity tests. <sup>7</sup> After toxoid sensitivity test. <sup>8</sup> Diphtheria only, not DTP or diphtheria-tetanus. <sup>9</sup> Reference 6. <sup>10</sup> No written policies, but description of work is quite up to date. <sup>11</sup> Primary series repeated at 6 years if Schick positive. <sup>12</sup> Repeated Schick tests used.

Territories make no mention of routine tetanus toxoid booster doses beyond school age (table 2). Two States recommend that persons get a tetanus booster dose every 2 to 3 years. Eleven States and one Territory recommend this dose every 3 years. One State recommends an interval of 3 to 4, and 6 States recommend 3 to 5 years. Two States recommend a booster dose every 4 years, and 3 States recommend boosters every 5 years. Hawaii recommends a tetanus toxoid booster every 8 years, and Massachusetts recommends a 5-year interval through school years, and an interval of 10 years after school. Arkansas will follow the same schedule as Massachusetts.

### Smallpox Vaccination Policies

The emphasis placed upon repeated smallpox vaccinations likewise varies from State to State, although nearly all States mention revaccination in the presence of a smallpox epidemic. Eighteen States and two Territories recommend revaccination at 5-year intervals throughout life, while others recommend it every 5 to 6 years, 5 to 7, 5 to 9, or 5 to 10 years (table 2). A few States recommend intervals of 3 years, 3 to 4, or 3 to 5, or 4 to 5 years. Connecticut recommends revaccination "periodically." Nine States and two Territories make no mention in their immunization policies of smallpox vaccinations continued on through school and adulthood, while Oklahoma continues smallpox vaccinations only through school. Ipsen, of the Massachusetts Department of Public Health, recently advocated an interval of 10 years between smallpox vaccinations in adults as providing a level of immunity in the population sufficient to prevent rapid epidemic spread of the disease (6). Arkansas will follow this policy.

Only a few States indicate how soon a smallpox vaccination should be repeated if it fails to take. Pennsylvania permits it to be repeated in 5 days, Missouri permits it in 7 to 9 days, and Arkansas, Michigan, and Oklahoma permit it in 2 weeks. Idaho, Iowa, and Mississippi require a 3-week wait, and New Mexico and West Virginia require 4 weeks between vaccination attempts.

### Typhoid Immunization Policies

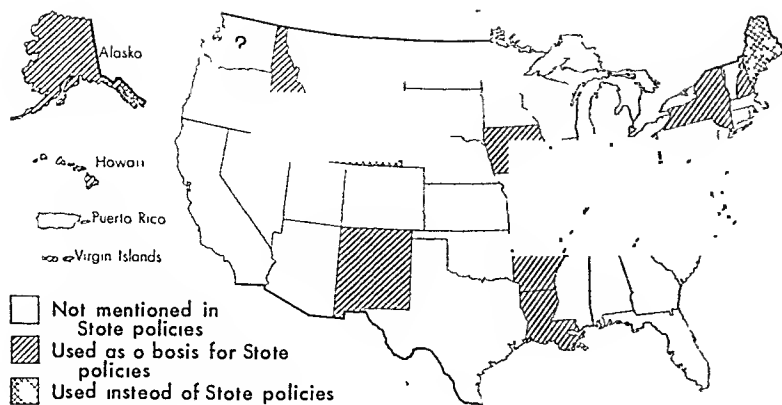
The giving of immunizations against typhoid fever is subject to wide variation. On one extreme are 10 States and the Virgin Islands which do not carry out this immunization or do not mention it in their policies. On the other extreme, Hawaii requires universal typhoid immunization by law. Most States take a middle ground, recommending typhoid immunization only for individuals exposed to a case of the disease or to a carrier, for individuals forced to use an unsafe water supply (as in disaster areas), for individuals dwelling in or traveling into areas where the disease is endemic, and sometimes for individuals about to go to a summer camp or about to travel generally. Most southern and southwestern States and Puerto Rico place greater emphasis on the immunization, or have done so in the past. These States generally recognize the need for this immunization on a routine basis in portions of their rural areas at the present time.

The interval permitted between typhoid vaccine injections in the primary series is about 1 week in 11 States and 1 Territory, 1 to 2 weeks in 3 States, 1 to 3 weeks in 1 State, and 1 to 4 weeks in 13 States and 2 Territories, and 1 month in 1 State.

A minimum age for starting typhoid immunizations is usually not stated, but in 14 States typhoid vaccine is given at any age when indicated. In 5 States and 1 Territory it is given at age 1 or under when needed, and in 2 States only over age 1.

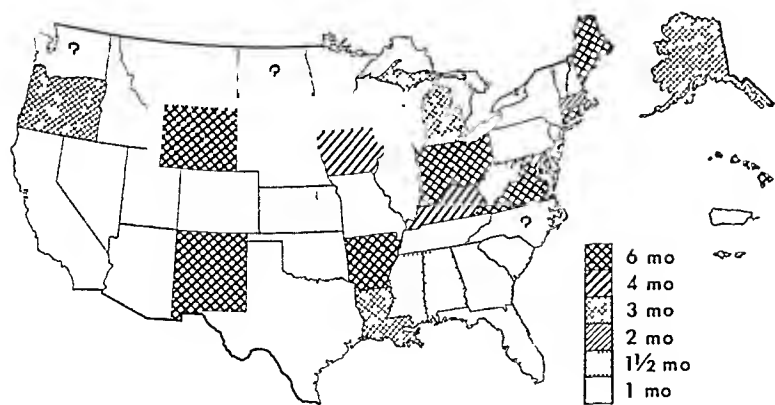
Of the 37 States and 3 Territories which mention typhoid immunizations, 22, including Arkansas, authorize and encourage the use of intradermal typhoid booster doses, either in their own publications or through endorsement of the American Academy of Pediatrics report. The other States simply do not mention intradermal typhoid booster doses; no State specifically forbids them.

The interval between typhoid booster doses is set at 1 year in 10 States, at 1 to 2 years in 13 States and 1 Territory, at 1 to 3 years in 1 State, at 2 to 3 years in 1 State, and at 3 years in 3 States, including Arkansas. It is not mentioned in the Puerto Rico manual.



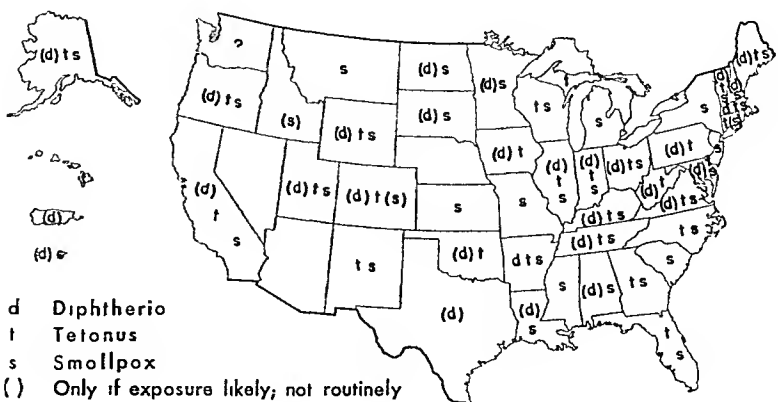
**Figure 1.**  
**Use by States of the American Academy of Pediatrics report.**

**Figure 2.**  
**Minimum ages recommended for starting primary DTP vaccination series.**



**Figure 3.**  
**Maximum intervals allowed between doses in primary DTP vaccination series.**

**Figure 4.**  
**Diphtheria, tetanus, and smallpox immunizations available or advocated for adults.**



**Table 2. Summary of smallpox, tetanus, and typhoid immunization policies in the United States and Territories**

State or Territory	Smallpox vaccination first given at age (months)	Smallpox vaccination intervals in adults (years)	Tetanus booster intervals in adults (years)	Typhoid immunization <sup>1</sup>		
				Begin at age (years)	Initial dose intervals (days)	Booster intervals (years)
Alabama	3	5-7	Not used	2	5-10	1.
Arizona	Any age	Not used	do	No mention	Not stated	Not stated.
Arkansas	With 1st DTP	10	10	With 1st DTP	7-28	3.
California	5	5	3-5	No mention	7-28	3.
Colorado	In 1st 12	In epidemic	2-3	1	7	2.
Connecticut	3-6	do	3	No mention	Not stated	Not stated.
Delaware	12	5-9	3			
District of Columbia <sup>(2)</sup>	After DTP	3-4	3-4	No mention	7-21	3.
Florida						
Georgia	5-6	5	5	do	Not stated	Not stated.
Idaho	By 6	In epidemic	Not used	No mention	do	do
Illinois	3-6	3	3-5	Any age	7-10	1-2.
Indiana	6-12	5	3	do	7-28	1-2.
Iowa	<sup>(3)</sup>	Not used	3-5	do	7-28	1.
Kansas	No mention	3-5	Not used			
Kentucky	3-6	5-7	2-3	½	5-14	2-3.
Louisiana	4	5	Not used	No mention	7-14	1.
Maine	6-12	5	3	Any age	7-28	1-2.
Maryland	6	Not used	Not used	do	7-28	1-2.
Massachusetts	3-9	10 <sup>4</sup>	10 <sup>4</sup>			
Michigan	Under 5	5	5	Any age	7-28	1.
Minnesota	3-12	5-6	Not used	No mention	7	1.
Mississippi	1½	5	do	½	5-14	1-2.
Missouri	3-4	5	do	Any age	7-10	1-2.
Montana	½	3-5	do			
Nebraska	3	Not used	do	No mention	7	1-2.
Nevada	With 1st DTP	do	do	do	Not stated	Not stated.
New Hampshire	Birth-36	5-7	do	Any age	7-10	1-2.
New Jersey	In 1st 12	5	do			
New Mexico	1½	5-10	3	1	7-28	1-2.
New York	3	5	Not used			
North Carolina	Under 3	5	3-5	1	7	1.
North Dakota	3	5-7	Not used			
Ohio	6-12	5	3	Any age	7-28	1-2.
Oklahoma	9	Not used	4	3	7	1.
Oregon	In 1st 12	5	3-5	Any age	7-28	1.
Pennsylvania	do	Not used	4			
Rhode Island	<sup>(5)</sup>	do	Not used			
South Carolina	5	5-7	do	1½	30	2.
South Dakota	No mention	5	do	No mention	7	1.
Tennessee	In 1st 12	5	3	Any age	7 or longer	1-2.
Texas	5-6	Not stated	Not stated	do	7-28	2.
Utah	3-6	4-5	3-5	1	7-10	1.
Vermont	2	5	3	No mention	Not stated	Not stated.
Virginia	6-12	5	3	Any age	7-28	1-2.
Washington <sup>(2)</sup>						
West Virginia	6	Not used	3	2	7 or longer	1-3.
Wisconsin	In 1st 12	3-5	5			
Wyoming	6-12	5	3	Any age	7-28	1-2.
Alaska	<sup>(6)</sup>	5	3	do	7-28	1-2.
Hawaii	5	Not used	8	½	7-28	2.
Puerto Rico	3-12	do	Not used	No mention	7	Not stated.
Virgin Islands	6	5	do			

<sup>1</sup> Typhoid immunizations not mentioned in policies of Delaware, Kansas, Massachusetts, Montana, New Jersey, New York, North Dakota, Pennsylvania, Rhode Island, Wisconsin, and the Virgin Islands. <sup>2</sup> Present policies not available. <sup>3</sup> Before or after DTP. <sup>4</sup> As recommended in reference 6. <sup>5</sup> Only mentioned as a procedure to be done by private physician. <sup>6</sup> With DTP or 1 month later.

## Public Education

Some States furnished samples of immunization information available to parents, and presumably most States have such material. Some of these pamphlets are very thoughtful and attractive, for example, those from Connecticut, Delaware, Idaho, Massachusetts, Minnesota, Nebraska, Wisconsin, and Hawaii.

Special emphasis is put on public information and education concerning immunizations in various ways by different States. Arkansas stresses information for the public and for school authorities in its new question and answer manual concerning immunizations. Delaware sends a letter concerning immunizations to every family as the new infant nears 4 months of age. The Iowa immunization manual places thoughtful emphasis on the approach to immunization, carefully preparing parents and children for the experience, and educating them on the nature and value of the immunizations.

In Kansas distribution of immunization information is made through the schools. Kentucky's manual contains a helpful question and answer section intended to prepare the person giving immunizations for some questions commonly asked by parents. Maryland's immunization schedule places emphasis on health education of the family concerning the nature, need, schedule, and value of immunizations at the time they are given.

Nebraska has a manual for community leaders concerning immunization programs, and, for teachers, quite extensive classroom discussion guides on immunizations. New Jersey has a thorough manual on communicable diseases for its schools. Both North and South Dakota stress preplanned public education by many routes.

Puerto Rico has prepared immunization policies in Spanish. Vermont uses a Canadian leaflet printed in French for its French-speaking population. There are doubtless many other special considerations and measures taken to assure public education in various States, which did not come to this reviewer's attention.

## Tuberculin Testing

Tuberculin testing is considered along with the immunization program in certain States.

Idaho recommends tuberculin testing of children at age 1 and again at age 3. Iowa mentions routine tuberculin testing of children. Michigan advocates tuberculin testing of children at ages 2 to 3. Texas uses tuberculin testing in its well child clinics, but cautions against mass school tuberculin testing without adequate followup.

## Discussion and Conclusions

The general impression gained in this comparative review of selected aspects of the immunization policies of the States and Territories is that some of the variation from one area to another is desirable and sensible, but much of the variation is needless and confusing. There should always be room for individualization of immunization programs, but there is no reason why there could not be more common agreement on standards of reference. The increasing use of the American Academy of Pediatrics report represents a trend in this direction.

One characteristic of immunization policies stood out. In virtually no other medical field have action policies been laid out with so little regard for citation of references or sources. In a sense, those States which have referred to the American Academy of Pediatrics report have cited authority, but the report itself (1952 edition) cites not a single reference to original studies. Apparently it has relied solely upon the organization's name to persuade the reader of the validity of the recommendations. Iowa, Kentucky, Oregon, Utah, and West Virginia present exceptions to this general observation, as they cite some references in their immunization policies. The manuals of Michigan and Pennsylvania are so thoughtful and thorough that they could not have been written without extensive knowledge of original studies, even though no references were made to such studies.

Massachusetts, with its own extensive program of original investigations of antigens and immunization schedules, occupies a unique position. Arkansas, with no facilities for original investigation, has felt a compulsion to cite the studies of others in justifying the current revisions made in its immunization policies and has embodied this bibliography in a question and answer manual on its immunization policies.

## REFERENCES

- (1) American Academy of Pediatrics: Report of the Committee on Immunization and Therapeutic Procedures for Acute Infectious Diseases. Evanston, Ill., The Academy, 1952, 69 pp.
- (2) Anderson, G. W.: Foreign and domestic trends in diphtheria. *Am. J. Pub. Health* 37: 1-6, January 1947.
- (3) Edsall, G.: Immunization of adults against diphtheria and tetanus. *Am. J. Pub. Health* 42: 393-400, April 1952.

- (4) Ipsen, J.: Circulating antitoxin at onset of diphtheria in 425 patients. *J. Immunol.* 54: 325-347, December 1946.
- (5) Edsall, G., Altman, J. S., and Gaspar, A. J.: Combined tetanus-diphtheria immunization of adults: Use of small doses of diphtheria toxoid. *Am. J. Pub. Health* 44: 1537-1545, December 1954.
- (6) Ipsen, J.: Immunization of adults against diphtheria and tetanus. *New England J. Med.* 251: 459-466, Sept. 16, 1954.

# technical publications

## Research Grants and Fellowships Awarded by the Public Health Service in 1954

*Public Health Service Publication No. 423. 1955. 70 pages. 25 cents.*

This booklet lists alphabetically by State and institution all research grants and research fellowships awarded by the National Institutes of Health, Public Health Service, for the period July 1, 1953, through June 30, 1954. There were 2,555 research grants in the amount of \$29,951,150 and 490 research fellowships in the amount of \$2,132,004.

These grants and fellowships went to individuals in 372 institutions, located in 43 States, 2 Territories, the District of Columbia, and in 13 foreign countries.

## Premarital Health Examination Legislation

*Public Health Service Publication No. 383. 1954. 114 pages. 40 cents.*

A compilation of the laws now in effect in 40 States and in Hawaii and Alaska, requiring a blood test and a physical examination for venereal disease as prerequisites for obtaining a marriage license, is contained in this publication. A history of the efforts to obtain enactment and an

analysis of the effectiveness of such laws are included.

A copy of the law in effect in each State or Territory is reproduced with citations to the legal sources.

## Studies on Household Sewage Disposal Systems—Part III

*Public Health Service Publication No. 397. 1954. 134 pages. \$1.00.*

Part III of these studies includes data and findings on single and multicompartment septic tanks, sludge and scum accumulation, soil-absorption capacity, clogging characteristics of septic-tank effluent, effect of zeolite softener salts, effect of ground garbage and synthetic detergents on household disposal systems, evapotranspiration and plant growth, and investigation of various distribution devices, sludge and scum measuring devices, design improvements, and septic-tank "cleaning" products.

Parts I and II of this report dealt with studies on individual sewage-disposal systems conducted at the Robert A. Taft Sanitary Engineering Center (then the Environmental Health Center), in Cincinnati, Ohio, from November 1946 to July 1949. Part III continues from that point to the end of the studies in June 1953.

The broad program of studies was financed jointly by the Housing and Home Finance Agency and the Public Health Service.

## Poultry Ordinance, 1955

*Public Health Service Publication No. 444. 1955. 37 pages.*

This model ordinance prepared for use by State and local governments to supplement Federal regulations came about through close cooperation among the Federal agencies concerned, State and local health and agricultural authorities, and the representatives of the poultry industry.

The ordinance embodies the best available information on poultry sanitation at the present time. It will be revised as new experience or research indicate. The current issue was prepared with the assistance of a public health-industry committee.

This section carries announcements of all new Public Health Service publications and of selected new publications on health topics prepared by other Federal Government agencies.

Publications for which prices are quoted are for sale by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. Orders should be accompanied by cash, check, or money order and should fully identify the publication. Public Health Service publications which do not carry price quotations, as well as single sample copies of those for which prices are shown, can be obtained without charge from the Public Inquiries Branch, Public Health Service, Washington 25, D. C.

The Public Health Service does not supply publications issued by other agencies.

*Although data available do not permit an accurate appraisal of Navajo health conditions, mortality and morbidity rates appear to be unnecessarily high.*

# Health Conditions Among Navajo Indians

By J. NIXON HADLEY

THE NAVAJO Reservation, located at the only point in the United States where four States meet, occupies portions of Arizona, New Mexico, and Utah. It is a territory of about 25,000 square miles, approximately the same size as the State of West Virginia. It is an isolated territory, difficult of access. A major United States highway, No. 66, barely touches the southern border, and two subsidiary highways flank the reservation to the east and west. In between these, there are less than 100 miles of all-weather roads, according to a recent estimate (1).

The people whom we call Navajo call themselves *Dineh*, which means "The People." The name implies a feeling of self-sufficiency, a feeling which past history confirms. The Navajos occupy today approximately the same lands that they occupied before the arrival of Columbus. This occupancy has been continuous, except for 4 years' captivity at Fort Sumner in

eastern New Mexico after their subjugation by the Army about 90 years ago. The return was at their own request, because of their desire to live their own style of life in their home country. After the return few contacts with the surrounding white people were available or desired. As a result, the majority of the Navajos, even today, do not speak English, cannot read or write in any language, and follow a culture pattern which is still basically Navajo rather than white-American.

The isolation of the Navajos began to break shortly before World War II. The tribe had increased steadily, from about 9,000 in 1868 at the return from Fort Sumner to nearly 50,000 in 1940. The reservation, although large in acreage, is an arid land that can support no more than 35,000 persons at a minimum subsistence level (1). Overgrazing by the sheep and goats needed to maintain 50,000 persons at even a starvation level was deteriorating the land still further. Reduction of livestock to carrying capacity of the range was essential to avoid its complete destruction. This program involved the Navajo families in new contacts with non-Navajos representing the Soil Conservation Service and the Bureau of Indian Affairs, and, since emergency relief programs were substituted for lost income from livestock, with the Civilian Conservation Corps, the Public Works Administration, and other agencies. World War II increased outside contacts. Nearly

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4,000 Navajos were in the armed forces, and wartime labor shortages brought about such active recruiting even among non-English speaking Navajos that 15,000 worked off the reservation (1).

At present the Navajos are well aware of the surrounding world. They look to it for trade and employment as a supplement to their inadequate land resource. With increased contacts, attitudes are changing in regard to their need for education, medical care, and other similar benefits. Nevertheless, at present the Navajo is described as "ill-fed, ill-housed, sick, and uneducated" (2), even though prospects for future improvement are encouraging.

### Population Estimates

The members of the Navajo Tribe today probably number more than 70,000, but this figure is only a rough estimate. The last complete count was made in connection with the issuance of ration books during World War II. On the basis of this count, reports of vital events, and the United States census of 1950, the Navajo Agency estimates that in 1950 there were 69,000 Navajos who were residents of the Navajo Reservation or the adjacent allotted and public domain lands in New Mexico (3). The 1950 census could serve as only a partial check on the World War II count, primarily for two reasons.

First, the census recorded tribal affiliation of Indians only within the boundaries of major Indian reservations. Hence, it is known that there were 55,000 Navajos within the boundaries of the Navajo Reservation at the time of the census. Outside the reservation boundaries in New Mexico, there is a sufficiently large number of Navajos allotted on public domain lands to require that a hospital be operated at Crown Point for their benefit. Since tribal data are not available for Indians outside the reservations, the Navajos in this area cannot be tallied specifically, but the census reported about 9,000 Indians in this area who would be preponderantly Navajo.

Second, no allocation to place of residence was made in the census for migratory laborers, who were assumed to be residents of the place where they were found. As was indicated

above, the Navajo has a strong sense of attachment to his home country, and, consequently, even though forced by economic need to off-reservation employment he will normally return to the reservation at frequent intervals. It is a matter of record that in 1950 there were about 8,000 Navajos working intermittently for the railroads but who were also maintaining residential ties on the reservation. It is estimated that about 2,000 additional Navajos were working in mines, timber lands, reclamation projects, and the like in areas away from the reservation. An unknown, but probably minor, proportion of these were permanent nonresidents of the reservation.

It is not possible to determine exactly how many of the 9,000 Indians reported from the public domain area are Navajos, nor is it possible to determine exactly how many of the 10,000 Navajos working on nonreservation jobs should have been, but were not, reallocated in tabulations by residence to the reservation. It would seem, however, that the estimate of 69,000 resident Navajos in 1950, including public domain allottees and persons engaged in temporary off-reservation employment, might be low rather than high.

### Reporting of Vital Events

If the estimated figure for resident population is inaccurate, the main reason is to be found in the under-reporting of vital events. The test of birth registration completeness made in connection with the 1950 census throws some light on the problem of under-reporting. The test was conducted through the cooperation of the Bureau of the Census, the National Office of Vital Statistics, and the various State, Territorial, and independent city registration officials. It involved an attempt to match birth certificates with cards prepared by the census enumerators for all infants found by them who had been born during the 3-month period preceding the date of the census (4). For the six counties which include the Navajo Reservation, the birth registration test revealed that the names of less than one-half of the Indian infants born during the test period could be matched to filed birth certificates, according to unpublished tabulations prepared by the National Office of



Vital Statistics. This is an improvement over 1940, when less than one-fourth could be matched (5).

In considering the results of the birth registration tests as a measure of registration completeness among the Navajos, however, it should be remembered that they represent the degree of success in matching names between two records for an illiterate and non-record-conscious people whose culture allows for easy change of name. The same individual may be known on different records as Silversmith's Son, recorded in either English or Navajo; Tall Man, recorded in either English or Navajo; and John Jones. If the recordkeeper knows a little Navajo, the identity of the Navajo and English forms of the same name may be recognized, but only field investigation will develop the identity of the three independent variants. Consequently, although we know that out of about 600 names on the Indian infant cards prepared by the census enumerators in the 6 Navajo counties there were approximately 300 that were not matched to birth certificates, we do not know how many unmatched birth certificates also remained.

A basic assumption of the birth registration test was that the infants listed on the infant cards were a representative sample of all infants and therefore that the addition of infants not listed would not affect the proportions of registered and unregistered births. Thus, there was an implied assumption that birth certificates not matched to cards represent infants for whom no card was made. As indicated above, this is not a safe assumption for the Navajos because of their custom of using alternate names. A possible alternative assumption is that the infants listed on the infant cards were a representative sample of the ratio of medically attended births to total births, an assumption which provides a slightly different estimate of birth registration completeness among the Navajos.

According to the census enumerators' reports, 47.5 percent of the 638 Indian infants born during the 3 months of 1950 in the Navajo area counties were delivered by a physician (table 1). Registered Indian births within these counties during all of 1950 have not been tabulated by person in attendance, but nonwhite births have. Since there were only 70 non-Indian

births among the 2,391 nonwhite births, the nonwhite births can be taken as representing Indians. According to the birth certificates filed for nonwhite residents during 1950 (6), 1,865 of the births were attended by a physician (table 2). If it is assumed, then, that these 1,865 births represented only 47.5 percent of the total number of births, the proportion reported by the census enumerators for the first 3 months, it can be estimated that there were actually about 3,900 total births during 1950, of which slightly more than 60 percent (2,391) were registered.

The 60-percent estimate of birth registration completeness corresponds moderately well with a 1944 estimate that about one-third of the births were not registered (7). However, the number of uncontrolled variants in all of these estimates is so large that about all that can be said with assurance is that a large but unknown proportion of Navajo births are not registered.

No data are available on the extent of under-registration of deaths among the Navajos. Since a considerable proportion of deaths occur in infancy and early childhood, it is assumed that an appreciable number are not recorded, but a percental measure of the degree of under-registration does not seem readily attainable.

### Birth and Death Rates

The effect of under-reporting of vital events on Navajo birth and death rates is evident in

**Table 1. Indian births during first 3 months of 1950 in Navajo area counties, as reported by census enumerators**

State and county	Total number of births	Attended by a physician	
		Number	Percent
Total.....	638	303	47.5
Arizona:			
Apache County.....	186	97	52.1
Coconino County.....	106	38	35.8
Navajo County.....	149	72	48.3
New Mexico:			
McKinley County.....	119	64	53.8
San Juan County.....	50	30	60.0
Utah:			
San Juan County.....	28	2	7.1

**Table 2. Registered nonwhite births during 1950 in the Navajo area counties**

State and county	Total number of births	Attended by a physician	
		Number	Percent
Total-----	2, 391	1, 865	85. 0
Arizona:			
Apache County-----	631	491	77. 8
Coconino County-----	369	334	90. 5
Navajo County-----	502	342	68. 1
New Mexico:			
McKinley County-----	577	450	78. 0
San Juan County-----	273	229	83. 9
Utah:			
San Juan County-----	39	15	48. 7

every study that has been made of Navajo health conditions. Two recent studies made by the Bureau of Indian Affairs will demonstrate the point (8, 9). These studies were based on Indian births and deaths by county as tabulated by the National Office of Vital Statistics. Rates were calculated on the resident Indian population as reported by the 1950 census. As indicated above, the census figures are probably an understatement to the extent of the number of persons absent as migratory laborers. If these persons were included in the base population, it would, of course, decrease the rates.

Without correction for underestimation of resident population or for under-reporting of births and deaths, the birth rate for the period 1949 through 1951 was calculated to be 32.7 per 1,000 resident population and the death rate to be 12.6 per 1,000 resident population. Both figures are lower than would be expected. The Apaches of San Carlos and Fort Apache Reservations of Arizona, one of the nearest neighbors to the Navajos, are reported to have a crude birth rate of 40.3 and a crude death rate of 19.6. The difference appears to be more likely under-reporting among the Navajos than any marked difference in actual conditions of the two groups.

Bearing in mind that rates for the Navajos are understated by an unknown but appreciable amount, a comparison of Navajo age-specific death rates with United States averages, as shown in table 3, is of interest. (The Navajo rates were calculated from National Office of

Vital Statistics data as described above.) Even on an understated basis the Navajo death rate for infants and preschool children is 5 times as high as the United States average. The infant mortality rate per 1,000 live births for the Navajos is 139.4, also about 5 times the United States average. The death rates for children of school age are about 3½ times as high, and for young adults, more than 4 times as high. Navajo death rates markedly exceed the United States averages at those ages when deaths are preponderantly from communicable diseases or accidents, that is from the most readily preventable causes. In the older age groups, Navajo death rates are as low as or lower than the United States rates.

### Causes of Death and Illness

The National Office of Vital Statistics has not tabulated deaths by cause for Indians in the six Navajo counties. The only cause-specific data available are those provided by the hospitals and clinics under the supervision of the Bureau of Indian Affairs. These data are still less complete than those in the tabulation above (which included all known deaths to Indian residents of the six counties), apparently covering about three-fourths of the deaths.

Without adjusting the data for under-reporting, they show that the three leading causes of death for the calendar year 1950 were tuberculosis, gastroenteric diseases, and ill-defined and unknown causes. Rates for these causes

**Table 3. Age-specific death rates per 1,000 population for the Navajos, 1949-51, and the total United States population, 1950**

Age group (in years)	Navajos	United States	Ratio
All ages-----	12. 6	9. 6	1. 31
0-4-----	36. 8	7. 5	4. 91
5-9-----	2. 1	. 6	3. 50
10-14-----	2. 1	. 6	3. 50
15-19-----	3. 9	1. 1	3. 55
20-24-----	6. 7	1. 5	4. 47
25-34-----	7. 8	1. 8	4. 33
35-44-----	6. 3	3. 6	1. 75
45-54-----	8. 9	8. 5	1. 05
55-64-----	13. 4	19. 1	. 70
65-74-----	27. 6	40. 7	. 68
75 and over-----	57. 1	109. 6	. 52

for the Navajos and the total United States population are given in table 4. The next three causes of death among the Navajos in 1950, according to Bureau of Indian Affairs data, were diseases peculiar to infancy, influenza and pneumonia, and accidental deaths. None of the three leading causes for the general population—diseases of the heart, malignant neoplasms, and vascular lesions affecting the central nervous system—was among the six leading causes for the Navajos.

Morbidity data for the reportable diseases are available for the calendar year 1953 from the same sources as deaths by cause, and it may be assumed that they are under-reported to at least the same degree as are deaths by cause. Even then, the case rates for many diseases are extremely high, as can be seen in table 5 (10).

Trachoma, a disease of negligible importance for the United States as a whole, is still one of the leading diseases among the Navajos. The rate for new cases not previously reported is nearly 600 per 100,000 population. Rates of more than 1,000 new cases per 100,000 population are reported for pneumonia and for tuberculosis. Rates for most of the common infectious diseases of childhood are high, particularly measles and mumps, for which rates are  $2\frac{1}{2}$  times the United States rates. However, scarlet fever and streptococcal sore throat are reported less than one-fifth as frequently as in the total United States population.

The major venereal diseases are reported about 3 to 6 times as frequently among the

**Table 4. Death rates per 1,000 population for the three leading causes of death among the Navajos and comparable rates for the total United States population, 1950**

Cause of death	Navajos	United States	Ratio <sup>1</sup>
All causes-----	9.8	9.6	1.01
Tuberculosis, all forms----	1.9	.2	8.29
Gastritis, enteritis, and so forth <sup>2</sup> -----	1.3	.1	25.65
Ill-defined and unknown causes-----	1.2	.1	7.87

<sup>1</sup> Ratios calculated on basis of rates per 100,000 population.

<sup>2</sup> International List Nos. 543, 571, 572.

**Table 5. Case rate per 100,000 population for 28 reportable diseases for the Navajos and for the total United States population, 1953**

Disease	Navajos	United States	Ratio
Pneumonias-----	1,137.7	11.2	101.58
Tuberculosis, all forms----	1,042.5	66.2	15.75
Measles-----	734.3	282.2	2.60
Trachoma-----	581.7	.5	1,163.40
Gonococcal infections----	553.4	157.6	3.51
Syphilis-----	543.1	96.0	5.66
Mumps-----	339.8	126.1	2.69
Chickenpox-----	209.8	202.3	1.04
Dysentery, all forms----	148.0	13.3	11.13
Infectious hepatitis-----	39.9	21.1	1.89
Whooping cough-----	30.9	23.4	1.32
Meningococcal infections----	21.9	3.2	6.84
Scarlet fever and strep- tococcal sore throat-----	15.4	84.8	.18
Poliomyelitis, acute-----	10.3	22.7	.45
Typhoid fever-----	6.4	1.5	4.27
Trichinosis-----	3.9	.2	19.50
Acute infectious encephal- itis-----	2.6	.7	3.71
Rocky Mountain spotted fever-----	2.6	.2	13.00
Chancroid-----	0	2.3	-----
Diphtheria-----	0	1.5	-----
Brucellosis-----	0	1.1	-----
Malaria-----	0	.9	-----
Lymphogranuloma vene- reum-----	0	.6	-----
Granuloma inguinal-----	0	.4	-----
Tularemia-----	0	.4	-----
Botulism-----	0	0.0	-----
Anthrax-----	0	0.0	-----
Rabies in man-----	0	0.0	-----

Navajos. No cases of the minor venereal diseases were reported, but in a population of less than 100,000 the probability of uncovering a case of a comparatively rare disease is not high.

Dysentery is over 10 times as frequent among the Navajos as in the total United States population, with a rate of about 150 per 100,000. This includes both bacillary and amebic dysentery. If data were available on the incidence of all gastroenteritis and diarrhea, hospital experience indicates that it would be one of the leading causes of illness.

## Summary

Measurement of health conditions among the Navajos is hampered by lack of complete data either on the base population involved or on deaths and illnesses. Even with this lack of specificity, however, it is obvious that mortality and morbidity rates for most of the major dis-

eases are far in excess of the rates for the total United States population.

#### REFERENCES

- (1) Krug, J. A.: The Navajo. A long-range program for Navajo rehabilitation. Washington, D. C., U. S. Department of the Interior, 1948.
- (2) Planning in action on the Navajo-Hopi Indian Reservations. A progress report on the land and its people. Washington, D. C., U. S. Bureau of Indian Affairs, 1952.
- (3) Harper, A. G.: Statistical data and other information relative to the Navajo and Hopi Indians. *In* Report with respect to the House Resolution authorizing the Committee on Interior and Insular Affairs to conduct an investigation of the Bureau of Indian Affairs. Union Calendar No. 790, 82d Cong., 2d sess. Washington, D. C., U. S. Government Printing Office, 1952.
- (4) Shapiro, S., and Schachter, J.: Birth registration completeness, United States, 1950. *Pub. Health Rep.* 67: 513-524, June 1952.
- (5) Hadley, J. N.: Registration of vital events among Indians. *In* Vital Statistics—Special Reports, vol. 33, No. 6. Washington, D. C., U. S. National Office of Vital Statistics, June 1950.
- (6) U. S. National Office of Vital Statistics: Vital statistics of the United States, 1950. Washington, D. C., U. S. Government Printing Office, 1951.
- (7) Hadley, J. N.: Promotion of birth registration among Indians. *Estadistica* 6: 68-75, March 1948.
- (8) U. S. Bureau of Indian Affairs: Live births and infant deaths by Indian agency areas by race: United States, 1950. Processed.
- (9) U. S. Bureau of Indian Affairs: Deaths by age by Indian agency areas: United States and Alaska, 1950. Processed.
- (10) U. S. Bureau of Indian Affairs: Communicable diseases among Indians. Processed.

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## Memorandums on Economic Poisons

In April 1955 the Technical Development Laboratories of the Communicable Disease Center, Public Health Service, made available its annual revision of the material on economic poisons. In mimeographed form, the memorandums are designed primarily for the guidance of physicians who are directly concerned with diagnosis and treatment of persons extensively or intensively exposed to insecticides.

Each clinical memorandum, after briefly giving information on the identity, formulations, and uses of a poison, discusses its toxicology with special reference to human cases, the dangerous dose in man, laboratory findings, and treatment. Each operational memorandum gives formulations and procedures for the control of the various susceptible insects or rodents that are of importance to public health. The chemical memorandums deal with the preparation of biological samples and their analysis for insecticides.

The revision contains separate clinical and operational memorandums on benzene hexachloride, chlordane, DDT, demeton, dieldrin, dilan, parathion, sodium monofluoroacetate (1080), TEPP, toxaphene, and warfarin. There are also clinical memorandums on dinitrophenols, kerosene, and xylene; and operational memorandums on aldrin, allethrin, ANTU, DDD, Diazinon, Dipterex, EPN, heptachlor, lindane, malathion, methoxychlor, Pival, and pyrethrum. There are chemical memorandums on DDT and lindane.

Persons who may have use for such memorandums may request copies from the Technical Development Laboratories of the Technology Branch of the Communicable Disease Center, U. S. Public Health Service, Box 769, Savannah, Ga.

# PSYCHOLOGY OF AGING

## *Bethesda Conference*

A conference to plan for research on the psychological aspects of aging was held April 25–27, 1955, at the National Institutes of Health, Public Health Service, Bethesda, Md., under the joint sponsorship of the American Psychological Association and the National Institute of Mental Health. Twenty-seven experts in the fields of psychology, biology, and sociology—many of them former leaders in child psychology—met to consider the most profitable methods for studying the aging process from infancy through old age. Public Health Reports presents in brief eight papers from the conference as representative of the five panels of the program.

# Two Aspects of Adjustment

**PHR** Members of this panel on the personal and social adjustments made by the aging person have fixed their attention on the adult years, from 30 or 40 to 60 or 65. They agree that adjustment has two aspects: an outer aspect, that of social adjustment, and an inner aspect, that of personal adjustment.

According to Kuhlen, external observers evaluate the social adjustment of a person in terms of his objectively measured capacity to function appropriately and efficiently in his dealing with the external world. Efficiency and performance on the job or status and functioning within a group, as viewed by that group, represent examples of social adjustment.

With respect to inner adjustment, Kuhlen believes that a person is deemed to be personally adjusted to the extent that he achieves a relatively integrated satisfaction of his various psychological needs; experiences a pleasurable sense of well-being, contentment, and relative freedom from unpleasant tension and anxiety; and is able to maintain this state of affairs by dealing with frustrating and threatening situations constructively and with a minimum of handicapping emotional stress.

Three papers are concerned mainly with personal adjustment, and a fourth—my own—deals with social adjustment. The papers on personality agree in using concepts which mean that a person who is well-adjusted is able to cope with a complex world. These concepts are: affective complexity (complexity of emotional reactions to a complex world), tolerance of ambiguity, flexibility, expansion. Indicative of poor adjustment are the concepts of

rigidity, simplicity, constriction. None of the three papers attempts to set out explicit criteria for good adjustment, or successful aging, yet each one offers some implicit criteria of success.

Kuhlen writes of the "quality" of adjustment as dependent on the satisfaction of certain basic psychological needs, but his interest lies more in describing and measuring changes in personal adjustment during the adult years than in measuring quality of adjustment.

Peck describes some variables which clearly have a favorable meaning for adjustment, but he does not seem to be willing to postulate these as conveying the meaning of the term "successful aging."

Henry says that affective complexity and clarity of perception of available roles in the individual's social life space might be the major variables for describing personal adjustment. He concludes that these two factors are not seen as necessarily being definitive of the concepts of adjustment or successful aging but as providing an important empirical basis for subsequent study of persons independently judged successful or unsuccessful in respect to general life adjustment or to some specific life role.

Henry writes that all situations in adult life involve stress for the individual and that it is the manner of adaptation to this stress which constitutes the variable of greatest importance in successful living.

It might be useful for members of this panel to explore the extent of agreement and disagreement between Henry's strategy of studying the individual's ways of coping with the complexities and stress of the world and the proposals by Peck and Kuhlen that it is not so much the person's way of adapting to his life situation which is important but rather his retaining the offensive in his approach to life so as to maintain activity and expansion.

Another path for exploration is that of the techniques and the most useful combinations of techniques we can use in the study of adult personality.

Henry relies on projective techniques—the thematic apperception technique and the sentence completion test—which reveal the inner personality. Peck would use an intensive personal interview, supplemented by projective in-

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*By Robert J. Havighurst, Ph.D., professor of education, University of Chicago. As coordinator of the opening panel on research on personality and social adjustment, Dr. Havighurst in his paper summarized and commented on the papers of William E. Henry, Ray G. Kuhlen, and Robert F. Peck.*

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struments, self-ratings, and interviewer ratings. Kuhlen uses attitude scales and other forms of self-report.

Still another question for consideration is that of the nature of the group of people to be studied. Normal people should be studied, we all agree, but should they be selected on a sample basis at random from the population or from certain social classes or occupational groups? Should they be volunteers who are happy to cooperate in our research, or should they be a randomly selected group containing those who are neutral or even hostile to our research?

## Assessment of Aging

PHR

In both physiology and psychology, work on animals has made such extensive contributions that from the standpoints of theory and practice it is impossible to trace many significant generalizations to either area, so interwoven are animal and human studies. In the field of aging, however, interest is only now returning to animals after a lag of some 30 years. Yet animals with their short life span and great possibilities for control of conditions are ideal for aging studies. Calhoun examines this area in some detail.

One can say that every scientific problem on human beings at some point dips into the genetic background of the person. Even longevity varies with and within species and leads to the assumption of upper limit to the life span for the individual and the species.

Have we really modified that limit by our

changing life expectancy, or has it remained substantially the same?

Kallman points out that there is a wide variety of other genetic problems within this general area. Studies of the genetic basis of aging are important both for understanding what happens to older persons and for the understanding of all life.

Underlying human behavior is the nervous system, which not only is our trigger, tracking and holding device, but also the integrator. Modern developments in the construction of computers and automation have given new insights into the range and variety of its functions.

Streicher shows that, although the changes in the aging nervous system are substantial and cumulative, their significance for behavior is not altogether clear.

Here is a link between Calhoun and Kallman. Genetic studies of aging in animal nervous systems along with experimentally introduced conditions and subsequent studies of nervous structures in animals offer much hope, not only as supplements to studies on human beings but also as ways of obtaining knowledge of fundamental relations.

If we consider the human being as a communication system which converts incoming stimulation into activity, the speed with which that system transmits messages becomes an important factor.

Birren's paper is devoted to this important problem. In a sense we are viewing the functioning of the nervous system from another angle. Perhaps the phenomena described by Streicher are reflected in the phenomena described by Birren.

### Environmental Settings

Kleemeier's concern is with the effect of environmental settings upon the behavior and adjustment of older persons. This is a very large area with many psychological implications that have never been fully explored, yet millions of dollars are expended each year in the design of living arrangements for older people.

A multitude of problems of psychological moment have arisen in the design of institutions and homes for older people upon which a psy-

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*By John E. Anderson, Ph.D., professor, University of Minnesota, and former director of the Institute of Child Welfare. Dr. Anderson, as chairman of the panel on the assessment of aging—background in theory and experiment, summarized papers presented by James E. Birren, John C. Calhoun, Franz Kallman, Robert W. Kleemeier, and Eugene Streicher.*

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chologist should be able to give advice, but he finds little in the literature with which to answer the practical questions of the architect.

How many foot-candles of illumination should be provided for older people?

How thick should walls be to control noise?

What types of knobs and catches are easiest for old people to manipulate? Where should they be located?

What types of equipment and materials facilitate self-help? How do you teach an old person to learn to use the equipment?

We need to know both the optimal pattern, arrangement, or design, and how to bring the old person to adapt to it.

Another interesting problem of settings concerns the relation of design to findings in other scientific areas. To what extent should the design of living arrangements take into account activities and recreation?

### **Cataloging Changes With Age**

It seems to me that many features of decline in older persons resemble aspects of growth in children. Decline like growth is neither uniform in all individuals nor for all processes and functions within the individual. Quite apart from pathological changes, variations in the rate and character of declines appear.

Much as in the earlier period of growth studies, we need to describe and plot these changes in a wide variety of structures and functions against time or age in order to catalog what occurs. Problems of the interrelations of these various declines then arise.

Is there an overall commonality in decline which can be used as a base from which to analyze the decline of particular parts or structures, or is it the summation of a host of specific declines?

There are also the problems of the point at which decline begins and the point at which it becomes crucial for the functioning of the part and of the organism as a whole. These problems resemble those of the initial and terminal points for growth.

In addition, we need detailed information on the effect of age upon the rate of recovery from insults and upon the rate of learning. Both of these involve specifically designed experimental

studies, with care exercised to explore the phenomena at several scattered age levels since we need to know the age ranges over which such basic mechanisms operate.

In modern psychology there has been a movement toward so-called hypothesis research in terms of theoretical models and constructs. But in the study of living organisms such developments represent an advanced stage in the history of science, which appears only after a great wealth of descriptive, observational, and crude experimental data is available. From this point of view the scientific study of aging is still in the exploratory and programing stage.

Studies, then, of a variety of structures and processes made on cross sections of persons sampled by age and by other criteria from the population in ways that can be described with precision are badly needed. We find many areas of meager information on what seem to be simple and obvious variables. Our cataloging has been haphazard rather than systematic.

### **Neglect of Sampling**

In contrast to the many well-designed studies at earlier age levels, we find masses of anecdotes, case studies, and surveys often presented without specific age reference. We find many studies in which individuals from 60 to 85 are grouped together without any age breakup of the data, yet no good basis exists for this grouping since we know that the change that occurs from 60 to 85 is tremendous.

We find much neglect of sampling. Some of the studies in the late 1920's set up better sampling controls than do more recent studies. To a much greater extent than in any other area, investigators on aging take whatever subjects are at hand. Often, even when available subjects are used, no attempt is made to define the sample in terms of such standard categories as education, socioeconomic status, and occupation.

### **Areas of Research**

As the human being moves forward in time, he carries with him many functions and capacities which together make up his personality. We may well ask questions about the effect of aging upon different classes of phenomena in



order to envisage various research possibilities.

1. There are undeveloped capacities. Generally we assume that of the resources available at birth only a few can reach full potentiality because of the limitations of time and the high selectivity imposed by the fact that the person can only do one thing at a time.

We may well ask how long such capacities can be retained and how and when they can most effectively be activated? To what extent do they depend on other characteristics that change with age?

If the resources of an older group of persons could be explored and deliberate attempts made to develop particular capacities, we would learn more about holding mechanisms as well as about educability.

2. There are the emergency reaction mechanisms which are called into play when stress arises. In addition to the repair and learning mechanisms, these involve the emotional and motivating devices which underlie adaptation, adjustment, and problem solving in a very broad sense. We need data about age relations, the preservation of the mechanisms, and their interrelations with other functions.

3. There are the skills and knowledges of the person, the thousands of organizations of behavior in all degrees of complexity built up during his life and carried forward in some degree to later periods. Many are kept functioning by incidental practice. All have some degree of dependence on subordinate processes. They are affected by growing deficiencies in sense organs, muscles, in communication pathways, and in subassemblies.

4. There are the attitudes and value systems, of the person, which are products of life experience that seem to be carried forward with even more stability than many of the skills and knowledges. We need knowledge about the origin and maintenance of rigidity and flexibility in the system as a whole, as well as in the various parts and functions.

### **Preservation of Function**

Finally, I come to what I consider the most important research problem—the relation between use and activity and the preservation of function. The hypothesis may be formulated

in general terms as “energetic activity accompanied by deep concern delays deterioration for a measurable time.”

This proposition has both physical and psychological implications. On the physical side, there might be an optimal activity level for maintaining the best tone and greatest functional effectiveness in the bodily mechanism. On the psychological side, there might also be an optimal level of functioning for preserving tone and effectiveness.

The principle is related to a biological principle of greater extension, namely, that use both increases and preserves functioning and that in a living organism a minimal rate of interchange with the environment results in deterioration.

In considering this proposition it becomes clear that deterioration will ultimately come because even apart from pathological changes, the force which we call life runs down. But potentials under optimal conditions are probably far greater than we ordinarily assume. If we could throw out the cases in which there is failure of a specific organ or function and direct our attention to a group of essentially sound, normal individuals moving along their course, the basic principle would become clearer.

The practical importance of this proposition, if established, grows out of the fact that the amount of use of an organ or structure or of the organism as a whole is, within limits, under our control. For the organism without pathology, it is almost the only factor which is under direct control. Yet when we search the scientific literature, we find little direct evidence supporting or denying the principle. Our practical literature now makes the basic assumption that participation, interest, and activity contribute to health. But we seem to be just at the end of a period when precisely the opposite assumption that inactivity promoted well-being, seemed to be generally held.

Moreover, in the popular mind the myth of retirement and the general conception of aging seem oriented about the principle that absence of activity is both beneficial and preservative.

I would like to know whether human beings wear out or rust out and when the process starts.

I would also like to know how to preserve and increase effective functioning.

And I would like to know the answers not only in terms of organisms as a whole, but also for particular processes and functions.

## The Aging Nervous System



Anatomical, physiological, and biochemical alterations of the central nervous system are possibly more intimately related to the behavioral aspects of aging than with almost any other single phase of psychology. However, the degree to which biological transformations modify the attributes of personality and mental ability remains largely unevaluated. The purpose of this paper is to highlight the major results of research on organic age changes in the brain, and no attempt is made to present a comprehensive review of the voluminous literature.

A number of distinct neuroanatomical alterations are usually encountered with advancing age. Brain weight and size are diminished by several percent, and the volume of the cerebrospinal fluid is increased. The dura mater is thickened and may contain deposits of calcium. Cell counts indicate loss of neurons accompanied by gliosis. Microscopically, changes include neurofibrillary thickening and contortion, deposition of argentophile material (senile plaques) of unknown origin, and the accumulation of pigmented substances (lipofuscin) composed of lipid and protein which may be derived from mitochondria. Anderson observed other histological transformations, such as hypochromatic staining of the Nissl substance, nuclear basophilia, and vacuolization. Although these apparently pathological alterations in the structure of the nervous system do not seem to have definite behavioral correlates, it is often assumed that advanced pathology of

this nature is accompanied by functional deterioration. However, with very few exceptions, the mass of data recorded on this subject is qualitative, and as yet it is uncertain whether or not senile dementia is associated with the pathology of specific regions of the brain, such as the thalamus. Of course the modifications that are observed in the aged brain cell do not constitute presumptive evidence of altered neuronal function.

### Electrophysiological Changes

Certain electrophysiological changes, such as slowing of the alpha rhythm and elevation of the threshold to electroshock, have been definitely associated with the aged nervous system. The aged usually manifest several neurological deficits as reflected in sensory loss and the absence of reflexes such as ankle jerks. Little is known of age changes in neural integration and synaptic transmission although Birren has clearly demonstrated in rats that auditory and electric shock reaction times increase after 24 months of age. Since the electrophysiological characteristics of peripheral nerve are normal, it appears fairly certain that the increased latency reflects alterations in central synaptic and neurointegrative mechanisms.

It is the contention of some investigators that mental aberrations associated with senility are primarily the result of subclinical vascular impairment which affects certain sensitive cortical regions. This would imply that the psychosis accompanying cerebral vascular pathology has a similar etiology to that of senile dementia, except for the extent and locus of the lesion. Others maintain that these two conditions represent distinct clinical and pathological entities, although some degree of arteriosclerosis is usually evident in most autopsy material independent of the presence or absence of behavioral symptomology. It should be emphasized that the occurrence of systemic arteriosclerosis is not necessarily indicative of cerebral involvement since the process of vascular aging in the systemic and cerebral vessels is dissimilar. In the rat, there is little evidence of neurovascular pathology accompanying the aging process, and it is therefore an ideal animal in which to study

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the aging nervous system without the complications imposed by vascular dysfunction.

As a rule the aged brain is more than normally susceptible to insult by vascular insufficiency. For example, therapeutic ligation of one common carotid artery in the older individual commonly produces a loss of consciousness. However, if the operation is carried out in a series of steps, syncope is often absent. Clinically, coronary insufficiency in an older person is sometimes diagnosed as apoplexy because of the predominance of neurological symptoms, and mental recovery is usually rather prolonged and may be incomplete. Cerebral blood flow is diminished with age, but only to about the same extent as the cerebral metabolic rate, that is, from 10 to 25 percent. It is still a matter of conjecture whether vascular pathology or neuronal loss is the primary cause of these effects.

### Biochemical Changes

Changes in the chemical constitution of human and animal tissue with advanced age have been observed for a variety of substances. Increases have been reported in the levels of sodium, lipid, calcium, and iron, and decreases in the concentrations of ascorbic acid and potassium. The water content of rat brain diminishes with age although in human material both increases and decreases have been observed. Also, a decline in the solubility of tissue protein has been noted.

The oxygen consumption of rat brain tissue measured *in vitro* decreases after 2 years of age. (Approximately 50 percent of the animals survive to 2 years of age, and about 1 to 5 percent are alive after 3 years.) The data reviewed by Kety indicate that the cerebral oxygen con-

sumption of unanesthetized male patients is approximately 10 to 25 percent lower in older subjects than in young men. However, the cerebral metabolic rate of "normal" old people and of patients with cerebral arteriosclerosis, or senile dementia, are essentially similar.

The rate of synthesis of neuronal protoplasm as a function of advancing age has yet to be determined although it is precisely this factor that is thought to be fundamentally implicated in the aging process. Thus the time required for the regeneration of sectioned nerves is prolonged in the 2-year-old rat.

There appear to be several rather profitable directions for research in neurobiological gerontology. The relationship of histopathology both to neuronal function and to behavior remains to be demonstrated. Progress in this sphere awaits the quantification of morphological data in terms of cellular loss, gliosis, and possibly alterations in the ground substance of the brain. On the biochemical side, major issues center about the rate and nature of enzyme activity and protoplasm synthesis in advanced age. Electrophysiological studies are also sorely required to evaluate the consequences of sensory impairment, synaptic interrelationships, and the efficiency of facilitatory and inhibitory mechanism responsible for neural integration.

The analysis of fetal and neonatal material at various ages constitutes one of the classic methods utilized by biologists to study structure-function relationships and to investigate the underlying mechanisms of cellular activity. At these early developmental stages there is a fairly good correlation between nervous structure and behavior. Unfortunately few of these investigations have been extended temporally to include mature and older material although

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"... what can I, upon the verge of my seventy-fourth birthday, with a shaking hand, a darkening eye, a drowsy brain, and with all my faculties dropping from me one by one, as the teeth are dropping from my head—what can I do for the cause of God and man, for the progress of human emancipation . . . Yet my conscience presses me on; let me but die upon the breach."

—John Quincy Adams (1767–1848)

the fundamental process of aging in cells has been studied by physiologists for almost a century. At the present time attention is focusing on these issues, not only because of the growing medical problems in this area, but also because of the unique basic biological information which can be elicited by such investigations.

## Changes in Speed and Timing

**PHR** The slowed reactions which are associated with the aging adult may be without apparent significance for the individual's social roles, esthetic values, or happiness. Yet, as a vantage point for exploring the nature of the changes in behavior and the aging nervous system, the study of age changes in speed and timing holds promise.

Speed and timing are important in survival. Even turtles or porcupines, which use a specialized form of passive defense, usually require a rapid timing of the defense reactions. The speed factor appears to be intrinsic to many types of activities. Individual differences in speed in the young adult may be largely a dependent variable in relation to motivation and other aspects of personality, but in the aging person speed or response latency (meaning the interval between stimulus and response) appears to be an independent variable for attributes of personality.

### Status of Time Measurements

Time measurements may be a very sensitive indicator of minimal changes in skills and may be used to differentiate levels of ability wherein no errors are made. When we are learning a mental or manual skill, speed continues to im-

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prove beyond the stage of making errors, but when a skill declines, the speed or timing may be affected before errors are noted. Time measurements are likewise useful in describing behavior and also have conceptual potential in linking psychological and physiological phenomena of aging.

Despite convincing evidence of age changes in speed of response, the measurement and analysis of time differences have not been regarded favorably by many psychologists, presumably because they reflect adversely on the performance of older individuals.

In mental testing of the elderly, time measurement is often avoided because time limitations are regarded as arbitrary penalties against the older person. Such views are without experimental validity. Recent physiological studies suggest that measurement of speed of simple responses can be useful in assaying the mental status of aging individuals. A speed writing test, for example, differentiated more clearly between patients with senile psychoses and control subjects than did various combinations of standard mental tests.

### Psychophysics and Aging

Research on aging has a deep concern with psychophysics by virtue of the kinds of changes which may occur with age in the relations of responses to properties of the stimuli. Psychophysics is concerned with relations between a physical continuum (stimulus) and a psychological continuum.

In general, the higher the intensity of a stimulus the greater must be the increase in intensity to be perceptible. The bearing of this relation to aging is seen in the results of Szafran. His findings that older persons benefit relatively more than the young from increased illumination prompt the question whether the age changes in sensory function are limited to the minimum energy required to stimulate or whether the whole range of discrimination has been changed.

In vision, it has been shown that the minimum light threshold is higher with advancing age. Coppinger's study in which he measured the flicker fusion threshold at three different brightness levels in young and elderly subjects

showed a smaller absolute increase for the elderly in threshold as brightness was increased.

This information can be used to equate stimulus intensities for young and aged subjects. If a stimulus is weak for an elderly subject, then presumably greater improvement will be seen in his judgments as the stimulus magnitude is increased than would be obtained in judgments in a young subject.

### Speed and Difficulty

A question of concern to many psychologists is how the performance of the elderly differs from that of the young when tasks are varied in difficulty. The term difficulty is generally applied to the stimulus and is defined by the response. Thus, a difficult problem is one which takes a long time to solve and which has a low probability of being solved correctly.

Kay reports experiments in which he found that the speed of response for the elderly was more affected than that of the young when the distance between the response keys and stimulus lights was increased. He makes a strong plea for controlling task difficulty.

My associates and I have studied both the probability of a correct response and speed in simple addition of columns of digits of varying length. As the series of digits was increased, the probability of a correct response declined more rapidly for the elderly than for the young, and the time required changed relatively more for the young than for the elderly although the absolute increases in time were greater for the elderly.

In a similar study of verbal fluency and aging, we measured difficulty by the number of words in the category to be associated. As fewer words became available, the elderly showed a greater absolute increase in time but a lower relative increase than the young subjects.

In verbal fluency there is no external stimulus which must be perceived. The subject generates his own associations according to a criterion or set. Thus, since not all of the changes in response latency can be attributed to alterations in sensory perception, there is the suggestion that internal associations in nor-

mal thought processes may be slower in advanced age.

We can infer that even for easy or familiar material there exists a type of latency in the linkage of perception and overt response which becomes slower in the elderly. We might also ask whether there is any relation between the speed of doing a task of near zero difficulty and the rate of change in performance as difficulty increases. In aged persons there is reason to suspect that the initial constants of performance bear an important relation to performance at higher levels of difficulty.

### Serial Movements

As a skill deteriorates it may again assume the quality of separate movements. There is evidence in Kay's experiments that older individuals have difficulty with timing of sequential tasks, but the role of the longer response latency in the sequence has yet to be thoroughly explored. In our own work we have seen that the handwriting of senile individuals tends toward a series of discrete movements instead of a smooth overlapping.

Timing appears to have a perceptual character—one "sees" or "feels" the right moment. If the serial elements of information follow one another too closely, the subject frequently does not respond. It is not known to what extent the discrete character of many activities is a result of altered perception.

Perhaps the study of age changes in humor in the adult years has been neglected from the viewpoints of timing as well as the kind of material which elicit laughter. This is an excellent field for a projective and neurophysiological study in which the content or meaning of events can be coupled with observations about how the content is handled by the nervous system.

### Speed and Inhibition

Perhaps more common in daily life than the demand response of the reaction-time measurement is the situation where the stimulus is anticipated and received in advance of the appropriate moment for the response. Good timing is thus as much a matter of inhibiting a

response until the proper moment as it is a matter of facilitation. Before regarding the slow behavior of the older animal as adaptive, it should be recalled that the aged animal cannot react quickly under any circumstance. Similarly, the slowness of an aged person crossing the street is maladaptive.

A distinction is often made between the brain of man and lower animals on the basis of size and possible combinations owing to man's greater number of neurons. A functional progression might also be emphasized—as one ascends the phylogenetic tree, animals become more able to delay appropriate behavior without the behavior being forgotten.

There is considerable evidence for a longer latent period with increased age, but further work is required to verify the existence of a reduced upper limit of time beyond which the response pattern disintegrates. Responses from senile subjects suggest that if a relevant response is not evoked in some maximum interval the stimulus or task has to be reinstated in order.

The hypothesis is that an age change occurs in the latent period and also that the maximum time a response may be delayed is reduced. Within these time limits the older person is apparently less able to inhibit a response. The evidence for this change in inhibitory control ranges from studies of language and learning to negative functions.

A recent study confirms the finding that the senile are both slow in their responses and show less inhibitory control over their associations. This evidence prompts the question whether the variable is not one of a dominant priority of association based upon experience rather than inability to control or inhibit an overlearned association in deference to an appropriate one. Results of learning experiments, however, suggest that with advanced age it is relatively more difficult to modify an older response than to acquire a new one.

Altered inhibitory control appears to be a more important variable in the behavior of the aged than is the priority of past experience or reduced ability to learn. To avoid a paradox in explaining the data it seems necessary to adopt the view that the responses of the elderly are faster relative to their latent period.

## Applying Our Knowledge

Perhaps we can make attempts to link results of mental tests, psychophysics, and neurophysiology by means of time and timing measurements. Knowledge of this kind may be applied for human benefit in three ways:

If defects associated with aging become clearly defined and localized, then particular environmental stresses may be reduced by engineering around the limitations.

In critical job performance, selection of personnel may be used to reduce particular stresses.

With adequate insight into the changes of aging it is likely that we can begin to develop social and biological prophylaxis to minimize the development of defects which are highly resistant to reversal once they appear.

The aged nervous system appears to be more determinate—the response tends to be a direction of the stimulus. There is, of course, the tendency to cultivate certain types of redundancy, that is, the social graces, and it is of interest that the social facade may be the last bit of behavior to disintegrate in a senile psychosis. The cultural pattern determines which areas of our behavior may be novel and which are expected to be predictable.

Cultural influences determine the sources and extent of motivations in the elderly. It may be a mistake, however, to assume that merely by raising the level of motivation, ability to learn always remains unimpaired. Thus, it is not easy to see why, if motivation is a dominant variable, elimination of errors for the elderly appears to be a more difficult process than acquisition of new responses.

Kay raises a most important issue when he questions the assumption of lower motivation as an explanation of the performance of the older individual. The assumption is tenuous that ability to learn remains unimpaired, whereas the motivation to learn declines, if only because of the difficulty in separating ability and motivation on an operational basis. Behavior is not infinitely plastic as evidenced by the persistence of patterns of neurotic adjustment. Further research should reveal information about life patterns which sustain plasticity of behavior with increased age.

# The Intellectual Functions

**PHR** Members of the panel on perceptual and intellectual abilities have discussed the strategy of attack upon problems of aging from several points of view.

Kaplan emphasizes the importance of comparative studies in normal and pathological groups, pointing to the need for more appropriate psychometrics, for better procedures in differential diagnosis, and for assiduous effort to coordinate psychological data with social, medical, and biological findings.

We do not know the extent to which psychotic deterioration has elements in common with normal decline. Kaplan makes the sound point that, until we have learned more about the nature of the senile psychoses, it is obviously unsafe to predict the ultimate role of psychology (or, he might add, of other disciplines) in the control of these disorders.

Mensch calls attention to gaps in our knowledge concerning the aging of sensory processes and touches on the problems in social perception and self-perception and their relation to personality. Perception is a topic of considerable current interest in the psychological laboratory but quite largely on the basis of theoretical formulations which ignore individual differences and age differences. Age changes in the sensory and perceptive processes should be examined in relation to physical and mental health and to experimental treatments such as in the hormone studies at Washington University.

Owens points to the need for environmental studies with older persons, as has been done for children. He would have studies of the influence of educational factors, the intellectual

demands of an occupation, and the effects of the social environment in terms of social status or of rural versus urban living.

## Need for Longitudinal Studies

All three agree as to the special need and unique value of longitudinal records. This rarely practiced approach is strongly advocated by Bayley, who emphasizes the need for obtaining information about individual differences in growth patterns.

Growth in both mental and physical traits may occur in many different channels and with idiosyncratic changes in rate. These changes are partly psychometric, owing to changes in test composition, and partly environmental. To some extent, however, they reflect an intrinsic patterning which cannot be predicted from a study of the external environment.

Individualities in growth may constitute long-term trends, as in the slower rate of mental growth of the feeble-minded, or short-term variations which have been conceived as related, to some extent, to the less adequate homeostatic mechanisms of early childhood. But the later years may also be marked by idiosyncratic changes, which can only be traced and related to antecedents if observed as phases of a life history.

## Current Studies

Bayley and Oden, in their study of a university group with extremely high ability levels, have shown that the gain in mental test score within an age range in which a decline is usually registered may be attributed partly to the high degree of selection in the sample and partly to the nature of the tests, which were essentially vocabulary tests (analogies and synonyms-antonyms). The hypothesis may be offered that at the extremely high ability levels of this group, the analogies test presents a mental task chiefly discriminating with regard to the knowledge of words.

In reviewing the work Conrad and I have done with a rural group, I have shown that while the information and opposites tests resist age decline, the task of analogical thinking becomes increasingly difficult in this sample, apart

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*By Harold E. Jones, Ph.D., director, Institute of Child Welfare, University of California, chairman of the panel on perceptive and intellectual abilities. Other members of the panel were Nancy Bayley, Oscar Kaplan, Ivan N. Mensch, William A. Owens, and L. L. Thurstone.*

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from changes which can be attributed to speed of reading.

Owens has found significant gains in several mental functions between the ages of 19 and 50. Since many studies have shown continued improvement in mental test scores during the years in college, possibly these gains were due chiefly to the fact that testing started before the end of adolescent mental growth. The growth from 19 to 23 in some functions perhaps was sufficient to mask an actual decline in the later decades. Special interest attaches, however, to the fact that for those retested at 50 the average alpha score was at about the 70 percentile of the scores at age 19, whereas for the same age interval in the same test Conrad and I found a decline of almost the same amount. To me this implies that the differences between our results and those of Owens are chiefly an expression of the age increase in variability, which is found in so many aspects of physiological and psychological functioning.

Owens offers two possible explanations of increasing individual differences: the cumulative effects of differential decline at different ability levels and the influence of organic impairments at all ability levels. It is not clear that the latter would significantly increase variability in intellectual functions unless the weight of impairment were greater at the lower levels.

Among children, the correlation between intelligence and measures of health or of freedom from physical handicap is nearly always found to be positive but too low to suggest an important degree of interaction. Over the decades, however, the cumulative effect of this relationship may deserve greater consideration, particularly when the decline in homeostatic functions makes it more difficult to resist the persistent and increasing drag of other impairments.

Renewed emphasis should be given to the necessity of studying the positive aspects of age changes, as well as the characteristic age losses. It is not realistic to expect that mental functions will be immune to the age changes which occur in other processes. But the role of intellectual abilities in social and occupational adjustment may not be the same at different ages. With diminishing mental speed and power, greater support may be enlisted by

some individuals from the reserves of skills and knowledge created through experience and from superior work habits. We need more information as to the conditions under which these reserves are best brought into play. At the highest levels of creative endeavor, it is probably rare for compensating factors to operate effectively beyond the middle years of life. But in more routine tasks, of possibly great social importance, the decrements in ability may for a long time be more than matched by increments in other work factors.

The study of these positive features of performance in later life deserves more attention than it has received in the past.

## Education of the Aging

PHR Many of the studies since Thorndike established the fact that older people can and do learn have been concerned with showing how they learn and particularly in what way their learning differs from that of younger persons.

These studies have shown that the learning of older individuals, as compared with that of younger adults, is characterized by a decreasing gradient of efficiency, as expressed in both errors and time scores, a greater use of habitual pattern of response, a more concrete approach to test tasks, a tendency toward feeling of inferiority in learning situations, a beneficial effect from recent practice in learning and recall, and a difference in ability to remember verbal rather than abstract materials.

Application of these findings would allow for some definite modification of educational techniques to take account of the special characteristics of the learning process in older adults.

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*By Wilma Donahue, Ph.D., chairman of the division of gerontology, Institute for Human Adjustment, University of Michigan, and a participant in the panel on learning, motivation, and education.*

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Some further investigations are indicated, however, before present-day knowledge is crystallized into an educational psychology for later maturity. Among the questions needing further study are some related to selection of test populations and to learning ability and education of older adults.

### Selection of Test Samples

The older adult group is not homogeneous. It consists of at least two subgroups: those who are to be classified as the aging and those who may be considered to have become definitely aged. It is particularly undesirable to lump these groups together in a single group, 50 and over, or 60 to 80, when considering the psychological effects of aging.

In the first group, the normal processes of senescence are not so profound as to have seriously changed the functionality of the individual. He is still coping effectively with his environment, still able to concentrate long enough and well enough to carry out instructions in test situations.

For the second group, degeneration may be assumed to be quite widespread; the individuals are apt to show symptoms of confusion, disorientation, and inability to continue independent living; or if they manage to maintain themselves, it is at great personal effort. In test situations, they tend to lose the set and to forget instructions before the task is completed.

In selecting samples of older adults for study, careful consideration needs to be given both to the use of criteria which will discriminate the aged from the aging and to other factors such as education and intelligence.

Other variables which should be considered are those of occupation, health, motivation, recency and extent of practice in skills required by the test, and environmental conditions in which the test is performed. Only when such variables are controlled can comparisons be made between different age groups with assurance that the individuals compared are equated on points effective in determining test scores or performance. The investigators who have been careful to equate some of these variables are the exception, and many studies need to be repeated under better and more controlled conditions.

### Learning Studies

The classic studies of Miles, Jones and Conrad, and Foulds and Raven have produced age curves with the same characteristics as the one described by Thorndike: a rapid rise to a peak efficiency in the twenties, then a slight down gradient for the thirties and forties, followed by an acceleration of the negative gradient. The shape of the curve remains essentially the same regardless of the nature of the material learned, but the magnitude of the change depends on the type of material learned.

Perhaps past studies have been definitive enough to establish the fact that age brings disablement in learning ability, but there are a number of further investigations which appear to be needed before such a conclusion is adopted unequivocally.

It is possible that the shape of the learning curve, based as it is on studies of groups of subjects of different ages, does not necessarily represent changes in the ability to learn with advancing age but may reflect the early onset of degenerative processes in a significant number of subjects.

Lack of criteria for measuring the early senescent changes may make it impossible to avoid an adverse effect on the average test performance of the age group. However, with the new Wechsler intelligence scale, it should be possible to select a group of the most effective oldsters in comparison to the norm for their peer group.

Investigators who have compared a younger with an older group of superior and presumably undeteriorated men usually show the older group to be definitely handicapped by what is assumed to be a slowing down of the mental processes. This conclusion, however, should be looked at carefully from the point of view of the attitudes and qualitative differences in the approaches of older learners as compared with those of younger ones.

For reasons known only by speculation, the older person approaches a learning task with a considerable feeling of inferiority, especially if he knows that his performance is to be compared with that of younger learners. Camp concluded that an older man does not differ from a younger one in his memory for recorded events or in his ability to learn but that inferi-

ority feelings constitute an emotional handicap to his learning.

Another study which illustrates the insecurity which older people feel when required to learn is that reported by Welford. He found that subjects in their twenties seemed to approach the learning task without any clear idea of what they were going to do and allowed the task to dictate their method while subjects in the thirties, forties, and some in the fifties and sixties asked questions about the methods of learning they should adopt before beginning their first trials. Apparently they felt the need to evolve a technique before beginning to work and hoped thereby to perform more intelligently.

Other interpretations, however, can be placed on the behavior of these older subjects. It may represent an attempt to apply some habitual type of solution to the new problem, thus avoiding the exertion of new learning. It may indicate less fluidity in thought processes than those of younger people, thus causing the older learner to take a more concrete approach to the problems. But it may be equally plausible to assume that the longer experience of older people has taught them the disadvantages of error and the advantages of succeeding in competitive situations, thus invoking some negative feelings toward any learning situation.

When the older student frankly adopts the eagerness for learning found among younger people, he frequently excels his younger classmates. But when he is defensive and fails to accept an exploratory learning approach, the experience is likely to be one of great frustration and emotion, and one which no amount of application can overcome. Studies are needed which will make clear the extent to which the difficulties of older people in learning are those resulting from changes in ability and to what extent they are the effects of experience and unfavorable attitudes.

### Effects of Practice in Learning

Lack of practice in learning may account for some learning disability among older adults.

Thorndike, like the doctor who prescribed digestion as the best cure for indigestion, sug-

gested that adult learning is probably a partial cure for adult inability to learn.

Sorenson, undertaking to test the theory that disuse—as expressed by the absence from methods used in acquiring information for university study—is the explanation for apparent disability in college courses with advancing age, reported that the slight disability of those who have not been engaged in vigorous learning for a period of several years can be overcome by resumption of study.

Further studies are needed to determine to what extent the renewed ability to learn and remember accruing from classroom experience can be transferred to the more casual living situations:

Must practice be provided in all types of learning, or does the training in learning one type of material serve as an antidote to difficulties in learning other kinds of material?

Is the improved ability to learn reflected in increased mental alertness in other situations?

How much learning must take place in order to restore the ability to peak level of efficiency, and how much must continue to take place to keep it there?

Do the various levels of intellectual ability respond to practice in adult learning in the same way, or is practice necessary only for the less able?

### Education of Older People

Few studies have been made as yet to determine the teaching methods and course content most useful in training older people. At present we must rely on known effective methods for children and youth. These may not differ greatly from methods which will be found to be most effective for older learners, but some adaptations undoubtedly are required.

Anderson says that young people and older adults improve performance with continued practice under motivation. Both start learning a task ineffectively and gradually attain expert skill. Both respond in the same way to skill of teachers, use of audiovisual aids, dramatic presentations. Both are strongly influenced toward learning by what their contemporaries do.

He also described differences between the two

age groups. The older individuals bring an accumulation of experience to the learning situation which may help or hinder the new learning. They are more concerned about the effects of their errors. They are more difficult to motivate and less willing to learn for the sake of learning.

Studies of motivation of older people to participate in any task or program are among the most pressing of today's needs. Literally, at present, much more is available to older people in the way of education, recreation, health programs, and so forth, than is being used by them. The task is how to motivate the aging person to want to take the initial step required to become a member of such groups and programs. The problem is complex and needs to be broken down into its several components.

Some of the difficulty lies in our lack of knowledge about how to communicate with older people. We know very little about how information reaches them, what channels of communication are open to them, and what relative values they place on different sources of information. Although radio listening and television viewing are common among the group, the effectiveness of the participation of the older person in this type of communication is practically unknown. Further, the extent to which information gained in this passive fashion can be expected to result in action is also still to be determined.

There is considerable resistance to participation in educational activities because older people do not feel that it is permissible for them to go to school. It is not until deeper understanding of the need for continued creative expression comes about that many older adults will take part willingly in learning activities. How to change attitudes of this type constitutes an important field of research.

Studies on the motivating values of different factors such as methods for presenting stimuli, knowledge of results, active versus passive participation, timing repetitions, reinforcing experiences, reward and punishment are needed as a basis for making adaptations in teaching methods and for inspiring adults to set and attain new levels of aspiration.

Education for aging is to be looked upon as the new challenge. Psychologists have a re-

sponsibility for determining the ability of adults to learn some of the things needed for the enjoyment of leisure and for determining methods for teaching and involving the adult in learning situations in order that new techniques for creative experience may be gained. The educator is faced with the challenge of applying his knowledge to the requirements and proper teaching of adults so that they may have the opportunity to pursue the stimulating aspects of life into old age.

## Skill and Employment

PHR My assignment is to try to indicate what we need to know about the organism as an efficient unit in relationship to aging. Of particular concern is the organism's essential goodness in terms of productivity.

Herein lies the implicit assumption that we ought to be able to assign some characteristic number to an individual which would serve as an index of his aging status much the same as the IQ is taken as a measure of intellectual capacity. While this represents an ideal, it is based on the assumption that there is some common factor involved in aging.

From a theoretical point of view, this is an important research problem. I see no reason why we should not attack it on a broad front much as we have approached the isolation of factors involved in other performances. We could apply a wide variety of performance tests to individuals over a wide age span and then see what common factors could be isolated from test results.

As I see it, until we have access to cooperative subjects in large numbers—with the active col-

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*By Nathan W. Shock, Ph.D., chief, Section on Gerontology, National Heart Institute, Public Health Service, Bethesda, Md., and visiting physiologist, the Baltimore City Hospitals. His brief is from the panel with the same title.*

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laboration of many research people and industry—we are going to be handicapped in describing age changes in performance. Since it appears that age changes are often related to reserve capacities, it is essential that any test batteries include measurements made not only under resting conditions but under conditions of measurable stress and displacement.

In addition, there is also the practicable problem of what older people can do. This is within the province of institutes of industrial relations and the research activities of private industries. A detailed job analysis, in order to determine the skills and conditions required for performance of these jobs, is an essential first step. Then would come an evaluation of the specific types of performance within aging workers, with the hope that ultimately requirements of the job and the capacities of the worker could be adequately matched.

Our laboratory (operated in collaboration with the Baltimore City Hospitals) has been interested in the problem of human performance for a number of years but has placed major emphasis on the physiological aspects of the problem, with an attempt to evaluate specific performance of organ systems as well as that of the total person. All I can hope to do is to present a few broad generalizations with respect to age changes in performance and to indicate questions which need further research.

### **Factors Affecting Performance**

Let us examine briefly some of the physiological limitations of performance that change with increasing age. When we are dealing with the human animal, the question immediately arises as to whether changes in physiological functions are due to disease or whether they can be regarded as the effects of age alone.

As I see it, we are interested in the performance of aging people, and if disease is an inherent part of the older organism, it will have to be accepted as such.

If we were able to study large numbers of individuals selected at random from the total population, we would not necessarily need to exclude subjects on the basis of medical examinations. However, when we choose subjects from an institution, we need to exclude subjects

with identifiable disease because the incidence of disease may be greater than in similar subjects living in the community. Thus, the research method and design depend on the population under study. Therefore, the first essential for effective studies of aging is the identification and description of the population under observation. Unfortunately, this has not always been done.

It is obvious that sensory changes may have an important bearing on performance. Rather extensive studies have shown that hearing for particularly high frequencies diminishes with increasing age. Studies on vision also show that the range of accommodation, visual acuity, rate and level of dark adaptation, pupil size, and the rate of flicker fusion frequency show a gradual impairment with increasing age. Vibratory sensitivity gives some indication of similar decrements with age. The problem of age changes in sensitivity to pain still awaits systematic investigation, owing largely to a lack of an acceptable objective measurement of pain.

Sensory changes associated with aging could serve as valuable indexes of the overall rate of aging in the individual even though they may be adequately corrected so that performance need not necessarily suffer. This also is a problem which has not been solved.

Of even greater importance to performance is the question of perception and the ability to extract information and utilize it in terms of behavior. This is a question which has received relatively little consideration from students of aging but for which extensive techniques have been recently developed by the Armed Forces.

The problem is one of determining the individual's ability to receive information presented simultaneously from a variety of sources and to abstract the information which is pertinent to specific performance. It would seem that this type of activity is one in which elderly people might show significant changes.

There is little doubt that the speed of performance diminishes with increasing age. This decrement in speed shows itself in studies of simple or complex reaction time, in speed of muscular movement, in psychological performance, and in even more complex performances included in many tests of intelligence.

Although Miles has demonstrated that reduction with age in performance includes both perceptual and effector processes, there is no information on the effects of age on the rate of performance of isolated muscle groups. Nor is there any information on the interrelationship in the same individual between speed of performance on different types of activity although a broad generalization would imply a relationship.

Welford, experimenting with the conceptions presented by Bartlett, has provided some evidence to indicate that simple measurements of the total time required for a given response should be supplemented with observations on the detailed segments of the total performance. Within this framework he has demonstrated significant age changes which otherwise would have escaped detection.

When we examine the performance of specific organ systems within individuals, we find a variety of age changes. Some systems show little evidence of functional alterations with increasing age. This is particularly true of measurements made under resting conditions where a number of physiological processes are involved in maintaining a stable equilibrium. However, under circumstances of physiological stress, age differences may be observed. For example, the rate at which the blood sugar is restored to resting levels, after the intravenous administration of excess glucose, diminishes significantly with increasing age. Similarly, the administration of an acid or an alkali requires more time in the older individual to readjust the acidity of the blood than in the young.

In other organ systems there is evidence of the reduction in function even in the resting state. For example, the amount of blood pumped by the heart, as well as the amount flowing through the kidneys, shows a gradual reduction as age increases.

Thus, our physiological studies have indicated that with increasing age there is a gradual reduction in reserve capacities and in the effectiveness of interorgan system correlation. A finding common to all these measurements is that the rate or speed of readjustment is diminished in the older individual.

We may well question the assumption that

the rate of metabolism of individual cells diminishes with age. While it is true that the basal oxygen consumption, taken as an index of overall rate of metabolism, diminishes gradually with increasing age, we cannot assume that this is a reflection of the rate of metabolism in individual cells. This is because with increasing age there is a gradual dropping out of functioning cells from various organs and tissues and an accumulation of body fat which does not contribute to metabolic activity. The apparent diminution in metabolism might well be a reflection of this change in functioning protoplasm and an accumulation of inert substances.

Our laboratory has attempted to relate basal oxygen consumption to a measure which might be more representative of the total amount of functioning protoplasm in the body. For this purpose, the total water content of the body, as measured by antipyrine, has been utilized. When the oxygen consumption per unit of body water is calculated for each individual, it is found that there is no decrement with increasing age.

When we turn to studies made on cells and tissues for an answer to this question, we face disappointment since relatively few studies on really old animals have been carried out and since no estimates of the number of cells remaining in the tissue slice, for example, have been made.

The effect of age on the ability to perform physical work has not been investigated extensively. Robinson's studies indicated that older people were unable to increase their pulse rates as effectively as young in response to exercise but did not find significant differences in oxygen uptake.

Similarly, Norris in our laboratory has found no difference in the efficiency of old versus young subjects performing standardized amounts of arm exercise. We do know, though, that older people are less able to perform heavy work and that their rate of recovery, with respect to pulse rate, respiration, or oxygen uptake, is diminished.

We also know that there is a gradual reduction in muscle strength and endurance in the higher age categories. Whether this diminution in muscle power is a result of loss of muscle cells, or whether it is more functional in nature

and comparable to an atrophy of disuse, is still an open question.

We do know that older individuals require a greater turnover of respiratory air in order to obtain a given level of oxygen uptake under conditions of exercise, but whether this is a respiratory impairment or can be ascribed to alterations in the capacity of the heart to pump blood is still another open question.

Although the mechanical efficiency of old and young is indistinguishable at moderate rates of work, at both low rates of work as well as at maximal rates of work, the mechanical efficiency of the older individual is impaired, Norris has observed. This opens an interesting point for investigation since the low efficiencies at slow rates of work in older people were completely unexpected.

It is possible that this impairment of efficiency is a reflection of poorer muscle coordination and impairment of neuromuscular control. Since the physical requirements of most jobs are minimal, the question of maximum workloads that older people can perform is of relatively little importance in problems of employment. Of greater importance is the question of endurance and the effects of repetitious tasks. This is a question which has not been systematically investigated on an age-wise basis.

and health are significant independent variables in relation to the social psychology of aging.

In the chronologically advanced years of life, especially for men, aging as perceived by oneself and by others is largely a function of withdrawal from making a living and of decline in state of health. Research shows that people of 60 and over who are occupationally active and in good health are younger in their own eyes and in the eyes of others than are those who have withdrawn from the labor force and are in poor health.

Somewhat less success has been derived from efforts either to establish or to interpret the relationship between occupational roles and health in old age. Most, but not all, research findings in this area show a positive correlation between the two variables.

Even if our findings were consistent, we would still be confronted by the problem of the meaning of the correlations. Which of the two variables is independent, and which one is dependent? Some claim that occupational roles are independent and that health is the dependent variable. Others argue that health is a predisposing factor rather than a consequence of occupational roles.

A tentative resolution to this controversy lies in the following compromise stated by Mathiasen:

Persons who die soon after retirement in all likelihood are succumbing to physiological conditions which would have caused death whether they had retired or not, but this does not rule out the possibility that retirement shock may precipitate an occasional fatal cardiovascular accident. It is difficult to estimate the effect of the sudden cessation of work on health in the absence of any techniques for measuring quantitatively the effects of emotional disturbance on health or for separating precisely the psychosomatic disorders from organic disease.

We may be inviting continuing frustration if we persist in taking an either-or theoretical position even in this modified compromise. For there is an inherent limitation in assuming that occupational roles and health are related to each other exclusively as independent and dependent variables in a yet unknown pattern. It may be more rewarding in the long run to consider them as interactive partners in a re-

## Occupational Roles



The dynamics and interrelationships of occupational roles, health, and aging comprise one of the crucial problems of gerontological research. Gerontologists in general would accept as reasonable the hypothesis that occupational roles

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*By Milton L. Barron, Ph.D., associate professor of sociology, City College, New York. Participating in the panel on skills and employment, in addition to Dr. Barron, were Ross McFarland, Josef Brozek, Charles Odell, and Nathan Shock.*

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ciprocal relationship. Each probably acts and is acted upon by the other although not with equal influence.

### **Misplaced Research Emphasis**

Gerontologists working on the problem of occupational roles in old age seem to assume that the transition from employment to retirement is the crux of difficulties associated with occupational roles. Yet research findings indicate that the unemployed aged who do not consider themselves to be retired have more acute economic, psychological, and social problems than do the unemployed aged who do consider themselves to be retired.

The reluctantly unemployed in our older population deserve far more attention from researchers than they have been given. Unwilling to tolerate the economic idleness to which they have been relegated, this group has the most emphatic minority-group reactions of all occupational groups among the chronologically aged.

Some of our findings definitely suggest that we have been concentrating on problems of physical health when we should be studying more intensively the problems of mental health. Physical ailments in the older population are not as severe and widespread as they are generally reputed to be.

The relatively little gerontological research on mental disorders in later life indicates that they are more extensive than problems of physical health. The Cornell University survey revealed that the majority of the urban older people are troubled some of the time by psychosomatic symptoms, nervousness, and forgetfulness. Much more needs to be known about the social and cultural bases of the major mental disorders of later life.

### **Social Science Concepts**

The time is overdue for more utilization of relevant social science concepts and theory in gerontological research on problems in mental health as well as other problems of aging. Studies have already intimated that the kind of social relations in which older persons participate is a crucial factor in the etiology of

their mental disorders. These social relations are fruitfully characterized by orthodox social science concepts such as Durkheim's "anomie," Jung's "loss of significance," and Faris and Dunham's "isolation."

The theoretical framework basic to much contemporary social psychology seems to be adaptable to gerontological research on problems of mental health. This framework implies that the social self not only embodies the group's normal attitudes but also the frustrations and confusions of the group. Society's tensions and cultural contradictions contribute to the conditioning of the self. When the self is mentally and emotionally disordered as well as physically ill, the family, the neighborhood, and society itself constitute a considerable part of the etiology.

The attention of gerontological researchers should be drawn to other potentially relevant concepts and theoretical schemes of social science as well:

Does the self-fulfilling prophecy have any bearing on the dynamics of occupational roles and health in old age?

Can we hypothesize that expectations of morbidity and mortality in old age are intensified by retirement so that they become self-fulfilling prophecies expressed in hypochondria and functional symptoms of illness?

To what extent does psychological unemployment account for the difficulties of the unemployed aged who do not consider themselves retired in returning to gainful employment?

Is unplanned, involuntary, and abrupt retirement the kind of experience meant by the concept catastrophic reaction?

The need-for-illness concept is another social psychosomatic tool with gerontological possibilities. It describes a condition which is an outgrowth of repeated frustrations in the individual in attempting to handle complicated problems. The person does not consciously seek illness as an escape but rather the care that one receives in illness, the kind of care that corresponds to the maternal love given a child who has met difficulties.

### **Middle-Class Norms**

A pitfall to be avoided is the indiscriminate gerontological usurpation of concepts and the-



oretical frameworks from a heretofore youth-bound social science. More than an imminent danger, possibly an actuality, is the heavy reliance of research on middle-class norms. Are the concepts adjustment, social satisfactions, and avocational interests truly free of restrictive class connotations?

There is some basis to the suspicion that educators, scientists, physicians, clergymen, and industrial and business personnel—typical middle-class sources—have played a more influential part in defining the problems of aging and introducing these norms to an age status in urban industrial society than have the representatives of other social classes.

This suspicion is reenforced by our observations of the negligence of older people in preparing for retirement. Many of the norms for such preparation are implicit in hobbies, travel, avocations, and club sociability, for these activities offer more appeal and meaning to older people of the middle classes than they do to those of lower economic, social, and educational strata.

Relevant here is Noetzel's observation that in some counseling programs, foreign-born and semiskilled manual workers react negatively to

any discussion of hobbies. To them the word connotes "make work," childishness, or futile play. This becomes especially significant in the face of evidence that older people in our society are geared socially toward the working classes more than to any other social strata. The Cornell survey found that the majority of its respondents considered themselves to be members of the working classes. Furthermore, the formal education of the sample was geared toward the lower level of cumulative years of schooling.

Gerontological research on the dynamics and interrelationships of occupational roles, health, and aging obviously cannot rely completely on concepts and theory already available in the social sciences. There is need for new, imaginative theoretical formulations; for example, the typology recently put forward by Riesman for analyzing materials gathered in the Kansas City study of middle age and aging.

Riesman points out that reaction to aging in the United States is largely governed by norms that vary according to social group. Not only do we need to recognize the substrata among older people, we must also adapt norms to the various substrata.

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## Medical Problems of Atomic Warfare

Medical problems facing the military services and the Nation in an atomic war will be presented at the 3-day program of the Association of Military Surgeons of the United States, meeting in Washington, D. C., November 7-9, 1955, for its 62d annual convention.

Topics will include the medical effects of nuclear warfare; care of mass casualties, such as protective measures, initial aid and rescue, and treatment of large numbers of blast, thermal, radiation, and neuropsychiatric casualties; and organizing the various medical and technical specialists and facilities for managing thousands of casualties at one time.

Scheduled for addresses are the Chairman of the Atomic Energy Commission; the Assistant Secretary of Defense (Health and Medical); the Surgeons General of the Army, Navy, Air Force, and the Public Health Service; medical chiefs of the Veterans Administration and the Federal Civil Defense Administration; and representatives of the medical industries.



# Major Causes of Illness and Death

Morbidity investigations usually study disease characteristics such as the distribution of cases by diagnosis, by age and sex, by season of the year, by acute and chronic manifestations, by severity in such terms as nondisabling, disabling, confinement to bed or to a hospital, and by the case fatality.

Many health workers are interested in the illness of different groups of persons rather than in given diseases. Age groups from infancy to old age differ a great deal in their illness patterns, and this paper is an attempt to show graphically the most frequent causes of illness of varying severity and of death in each of six age periods from preschool to old age. Needless to say that the causes of illness and death differ greatly as between early infancy and old age, although these two age periods have the highest death rates.

A separation of illness into acute and chronic diseases gives a picture of moderate but declining rates of acute illness in the preschool and early school ages, and of increasingly higher rates of chronic diseases as age increases. Carried to early infancy, this situation means extremely high death rates for the very young as well as extremely high illness and death rates for the aged, whose vital organs have degenerated over the long period of continuous functioning.

The major causes of illness and death at the different ages are not discussed in this summary, but the study includes charts which illustrate the illness, hospital care, and mortality picture for each of the six ages.



Public Health

MONOGRAPH

No. 30

The accompanying summary covers the principal findings presented in Public Health Monograph No. 30, published concurrently with this issue of Public Health Reports. The authors are with the Division of Public Health Methods, Public Health Service.

Readers wishing the data in full may purchase copies of the monograph from the Superintendent of Documents, Government Printing Office, Washington 25, D. C. A limited number of free copies are available to official agencies and others directly concerned on specific request to the Public Inquiries Branch of the Public Health Service. Copies will be found also in the libraries of professional schools and of the major universities and in selected public libraries.

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Collins, Selwyn D., Lehmann, Josephine L., and Trantham, Katharine S.: Major causes of illness and of death in six age periods. Public Health Monograph No. 30 (Public Health Service Publication No. 440). 22 pages. Illustrated. U. S. Government Printing Office, Washington, D. C., 1955. Price 25 cents.

*This report covering the continental United States is made jointly by the Tuberculosis Program, Division of Special Health Services, Public Health Service, and the National Tuberculosis Association.*

# Change in Tuberculosis Beds Occupied

—Spring 1954–Fall 1954—

By STANLEY GLASER, JOSEPHINE JOHNSTON,  
and DONALD A. TRAUGER

INFORMATION concerning the changes taking place in tuberculosis bed occupancy has been incomplete and has given rise to conflicting speculation. Because of this, the survey reported in this paper was undertaken to provide current trends in this important area of tuberculosis control. The results of this survey indicate that there has been an average decline of slightly more than 6.5 percent in the number of tuberculosis beds occupied in the continental United States in the 8-month period between April 1, 1954, and November 30, 1954.

For the last 50 years, emphasis has been largely placed upon providing more and more tuberculosis beds to accommodate the large number of patients who needed tuberculosis hospitalization. In the past, most States lacked enough beds for the care of the known tubercu-

losis patients. In many instances, the beds that were provided left much to be desired in terms of proximity to patients, adequacy of the physical plant in which they were located, and scope and quantity of services provided. In terms of numbers, however, the supply had begun to catch up to the demand in some places. Within the last year or so, a few States have been indicating that they have more than enough beds to take care of all of their tuberculosis patients and that beds were being closed, or were going unused in relatively large numbers. In an effort to determine the average degree of the downward trend and the variation from State to State, the Public Health Service and the National Tuberculosis Association have undertaken the study reported in this paper.

## Study Pattern

The Tuberculosis Program of the Public Health Service annually collects information about the number of tuberculosis patients hospitalized in the United States. This information is obtained directly from the hospitals which take tuberculosis patients for treatment or for temporary care. The information collected in connection with this inquiry for April

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*Mr. Glaser and Miss Johnston are statisticians with the Tuberculosis Program, Division of Special Health Services, Public Health Service. Their work in tuberculosis hospital statistics began in 1947 and 1951, respectively. Mr. Trauger is associate director, division of social research, National Tuberculosis Association.*

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1, 1954, was used as the study baseline (1).

In the fall of 1954, the National Tuberculosis Association inquired (2) as to the number of tuberculosis beds occupied in each hospital with tuberculosis beds. These data do not give information about any single day, but refer only to the day on which the replies were prepared. However, most of the data show the situation in November 1954. For convenience in notation, the data for April 1, 1954, are designated as "spring 1954," and the data collected subsequently by the National Tuberculosis Association and by the Public Health Service (as specified below) are designated as data for "fall 1954." In general, the data cover an 8-month span and are treated in this paper as though they were based on observations 8 months apart.

The number of non-Federal hospitals reporting in each week interval is shown here (2, 4-6) :

<i>Week</i>	<i>Number of hospitals</i>
<b>1954:</b>	
Prior to November 14-----	7
November 14-----	223
November 21-----	108
November 28-----	25
December 5-----	8
December 12-----	5
December 19-----	38
December 26-----	29
<b>1955:</b>	
January 3-----	10
January 10-----	7
January 17-----	2
January 24-----	1
Total -----	463

The National Tuberculosis Association data include information on the number of tuberculosis beds occupied in 450 non-Federal institutions. To this number the Public Health Service staff has added occupancy data for 145 hospitals (mostly Federal hospitals) bringing the total number of institutions in this study to 595. (Data for the 145 additional institutions were obtained from State health department reports, sanatorium reports, and Federal agency reports.) This paper presents the information resulting from the analysis and comparison of the data collected in the fall of 1954 with the data collected in the spring of 1954. For convenience, the term "TB bed occupancy" as used in this paper means the "number of TB beds

occupied," and does not denote "the percentage of TB bed capacity which is occupied."

### Estimate of Average Decrease

In the 595 Federal and non-Federal hospitals for which we had information, the decrease in occupancy in the 8-month period is 6.7 percent (table 1). We have no doubt that the seasonal fluctuation in tuberculosis bed occupancy is responsible for some part of this decrease. However, because we have little information about the magnitude of the seasonal fluctuation, we cannot estimate with confidence the percent decrease on an annual basis.

### Non-Federal Hospitals

Information obtained from the inquiry conducted by the Tuberculosis Program in the spring of 1954 indicated that on April 1, 1954, there were 75,951 patients occupying tuberculosis beds in 568 non-Federal institutions (1, 3). In the fall of 1954 data were available for 463 hospitals including 31 which had ceased to take tuberculosis patients sometime after April 1, 1954, and two new hospitals which were not in operation in the spring of 1954, but which had tuberculosis patients occupying beds in the fall of 1954. The number of tuberculosis beds occupied in the 463 hospitals declined by more than 7 percent in the 8-month period (table 1). These 463 hospitals represent about 82 percent of the non-Federal institutions which had 5 or more tuberculosis beds on April 1, 1954; 89 percent of the non-Federal tuberculosis beds which were occupied on that date were in these 463 hospitals (1-3).

Three hundred forty-seven of the 463 non-Federal hospitals are tuberculosis hospitals. In this group the decrease in beds occupied is 7 percent. The remaining 116 hospitals in the non-Federal group are chiefly general hospitals which have a specified number (5 or more) of tuberculosis beds. The number of tuberculosis beds occupied in these hospitals has declined by 9.5 percent (table 1).

A comparison of the number of tuberculosis beds occupied in non-Federal hospitals between the spring and fall of 1954 is shown in table 2. The analysis of

States in terms of the individual States as units has many disadvantages because of the lack of homogeneity within States and because of the lack of comparability between States. However, in spite of the fact that the State must be considered an arbitrary and—in some statistical senses—an unsatisfactory unit of comparison, it is a unit that is generally accepted and understood. It will serve here to illustrate the great differences geographically in the change in tuberculosis bed occupancy over the 8-month period under consideration. Observe, for instance, that while one State experienced a decrease of 24.6 percent in the number of non-Federal tuberculosis beds occupied, another State experienced an increase of 18.0 percent.

For these two States, every hospital that reported in the fall also reported in the spring. If reporting had been as complete for all other States, the greatest percent increase might have been more than 18 percent and the greatest percent decrease more than 24.6 percent, but neither of the extremes could have been smaller. Nineteen States showed decreases of less than 5 percent; 9 showed decreases of between 5 and 10 percent, and 13 had decreases of 10 percent or more. Seven showed increases ranging from about 2 percent to 18 percent.

### *Pattern of Change*

There is no apparent geographic pattern to the changes in absolute numbers or percentages.

**Table 1. Change in number of tuberculosis beds occupied, by type and control of hospital, continental United States, spring 1954–fall 1954**

Type and control	Number of hospitals <sup>1</sup>	Number of TB beds occupied		Increase or decrease in beds occupied spring 1954–fall 1954	
		Spring 1954	Fall 1954	Number	Percent
Total.....	595	86,530	80,751	–5,779	–6.7
Non-Federal hospitals.....	463	67,405	62,445	–4,960	–7.4
Tuberculosis hospitals.....	347	57,816	<sup>2</sup> 53,766	–4,050	–7.0
State.....	86	24,211	23,477	–734	–3.0
Local government (city, county, district).....	181	27,417	24,953	–2,464	–9.0
Other (private, eleemosynary, nonprofit).....	80	6,188	5,336	–852	–13.8
Other hospitals with assigned tuberculosis beds.....	116	9,589	8,679	–910	–9.5
State.....	8	544	543	–1	–0.2
Local government (city, county, district).....	76	7,881	7,190	–691	–8.8
Other (private, eleemosynary, nonprofit).....	32	1,164	946	–218	–18.7
Federal hospitals.....	132	19,125	18,306	–819	–4.3
Veterans Administration.....	<sup>3</sup> 108	15,739	15,334	–405	–2.6
Tuberculosis hospitals.....	21	7,787	7,514	–273	–3.5
Other hospitals.....	87	7,952	7,820	–132	–1.7
Other Federal hospitals.....	24	3,386	2,972	–414	–12.2

<sup>1</sup> Thirty-one of these hospitals had tuberculosis patients in the spring of 1954 but were closed to tuberculosis patients by the fall of 1954 and two new hospitals were not in operation in the spring of 1954 but had tuberculosis patients occupying beds in the fall of 1954. No hospitals are included which had less than 5 beds for the care of tuberculosis patients.

<sup>2</sup> Since this study relates to continental United States only, 150 Alaska native patients hospitalized under contract are not included. Fourteen of these are in local government hospitals; 136 in other private hospitals.

<sup>3</sup> In the spring of 1954 there were 95 hospitals with 5 or more tuberculosis beds; in the fall of 1954, there were 108. For comparative purposes the number of beds occupied has been enumerated on the basis of the reporting method in effect in the fall of 1954—by type of bed patient.

SOURCE: References 1–6.

Table 2. Change in number of tuberculosis beds occupied in non-Federal Hospitals, by State, continental United States, spring 1954-fall 1954

State	Number of hospitals <sup>1</sup>	Percent coverage <sup>2</sup>	Number of tuberculosis beds occupied		Increase or decrease in number of TB beds occupied, spring 1954-fall 1954	
			Spring 1954	Fall 1954	Number	Percent
Total.....	463	87.4	67,405	62,445	-4,960	-7.4
Alabama.....	6	78.0	566	560	-6	-1.1
Arizona.....	15	95.8	430	412	-18	-4.2
Arkansas.....	2	100.0	1,566	1,512	-54	-3.4
California.....	47	93.5	6,635	5,967	-668	-10.1
Colorado.....	13	86.7	874	784	-90	-10.3
Connecticut.....	9	100.0	1,374	1,087	-287	-20.9
Delaware.....	1	100.0	171	165	-6	-3.5
District of Columbia.....	4	100.0	939	891	-48	-5.1
Florida.....	6	100.0	1,814	1,803	-11	-0.6
Georgia.....	2	95.1	1,887	1,744	-143	-7.6
Idaho.....	1	100.0	75	74	-1	-1.3
Illinois.....	31	97.1	3,719	3,582	-137	-3.7
Indiana.....	8	69.7	939	900	-39	-4.2
Iowa.....	5	91.9	570	491	-79	-13.9
Kansas.....	3	100.0	394	362	-32	-8.1
Kentucky.....	9	65.9	945	917	-28	-3.0
Louisiana.....	6	55.8	626	598	-28	-4.5
Maine.....	4	100.0	329	273	-56	-17.0
Maryland.....	7	97.3	1,589	1,622	+33	+2.1
Massachusetts.....	22	91.2	2,369	2,152	-217	-9.2
Michigan.....	27	100.0	4,528	4,342	-186	-4.1
Minnesota.....	10	85.8	1,267	1,054	-213	-16.8
Mississippi.....	2	95.5	466	459	-7	-1.5
Missouri.....	5	90.2	1,453	1,349	-104	-7.2
Montana.....	1	100.0	178	210	+32	+18.0
Nebraska.....	2	100.0	179	168	-11	-6.1
Nevada.....	2	100.0	27	22	-5	-18.5
New Hampshire.....	2	100.0	128	121	-7	-5.5
New Jersey.....	14	81.0	2,139	2,037	-102	-4.8
New Mexico.....	2	13.7	50	57	+7	+14.0
New York.....	54	94.8	10,186	8,885	-1,301	-12.8
North Carolina.....	18	85.5	1,820	1,756	-64	-3.5
North Dakota.....	1	100.0	201	160	-41	-20.4
Ohio.....	23	96.0	3,322	3,140	-182	-5.5
Oklahoma.....	3	58.9	375	350	-25	-6.7
Oregon.....	5	100.0	504	525	+21	+4.2
Pennsylvania.....	24	72.5	4,023	3,904	-119	-3.0
Rhode Island.....	2	100.0	452	341	-111	-24.6
South Carolina.....	5	87.1	734	715	-19	-2.6
South Dakota.....	1	100.0	106	109	+3	+2.8
Tennessee.....	9	79.4	1,323	1,265	-58	-4.4
Texas.....	12	42.9	1,362	1,300	-62	-4.6
Utah.....	1	100.0	72	70	-2	-2.8
Vermont.....	1	28.9	35	37	+2	+5.7
Virginia.....	5	83.7	1,191	1,212	+21	+1.8
Washington.....	10	100.0	1,320	1,039	-281	-21.3
West Virginia.....	3	73.3	777	683	-94	-12.1
Wisconsin.....	18	92.0	1,376	1,239	-137	-10.0
Wyoming <sup>4</sup> .....	0	0				

<sup>1</sup> Number of hospitals for which reports were available in the fall of 1954.

<sup>2</sup> The proportion of tuberculosis beds in the State in April 1954 for which reports were available in the fall of 1954, based upon the rated tuberculosis capacity of the respondent hospitals, not upon the number of beds occupied.

<sup>3</sup> Adjusted for Alaska natives occupying beds.

<sup>4</sup> No data reported.

SOURCE: References 1-6.

**Table 3. Change in number of tuberculosis beds occupied in non-Federal hospitals, by size (TB rated capacity) and type of hospital, continental United States, spring 1954-fall 1954**

Size <sup>1</sup> (TB rated capacity) and type of hospital	Number of hospitals <sup>2</sup>	Number of TB beds occupied		Increase or decrease in number of TB beds occupied spring 1954-fall 1954	
		Spring 1954	Fall 1954	Number	Percent
All sizes (total).....	463	67,405	62,445	-4,960	-7.4
Tuberculosis.....	347	57,816	53,766	-4,050	-7.0
All other <sup>3</sup> .....	116	9,589	8,679	-910	-9.5
5-49 beds.....	122	2,733	2,140	-593	-21.7
Tuberculosis.....	62	1,577	1,191	-386	-24.5
All other <sup>3</sup> .....	60	1,156	949	-207	-17.9
50-99 beds.....	101	5,844	5,051	-793	-13.6
Tuberculosis.....	82	4,774	4,113	-661	-13.8
All other <sup>3</sup> .....	19	1,070	938	-132	-12.3
100-149 beds.....	76	6,997	6,365	-632	-9.0
Tuberculosis.....	62	5,706	5,169	-537	-9.4
All other <sup>3</sup> .....	14	1,291	1,196	-95	-7.4
150-249 beds.....	67	10,460	9,553	-907	-8.7
Tuberculosis.....	57	8,759	8,042	-717	-8.2
All other <sup>3</sup> .....	10	1,701	1,511	-190	-11.2
250-499 beds.....	66	19,468	18,410	-1,058	-5.4
Tuberculosis.....	55	16,311	15,426	-885	-5.4
All other <sup>3</sup> .....	11	3,157	2,984	-173	-5.5
500-2,999 beds.....	31	21,903	20,926	-977	-4.5
Tuberculosis.....	29	20,689	19,825	-864	-4.2
All other <sup>3</sup> .....	2	1,214	1,101	-113	-9.3

<sup>1</sup> Intervals in this column represent the official tuberculosis bed capacity for each of the hospitals included in that interval and are different from the corresponding column in table 6, in which the intervals show the decrease in the number of patients occupying tuberculosis beds between spring and fall of 1954.

<sup>2</sup> Number of hospitals for which reports were available in the fall of 1954.

<sup>3</sup> Chiefly general hospitals with facilities for tuberculosis patients.

SOURCE: References 1-6.

Furthermore, there is no relationship between the changes in tuberculosis beds occupied and the rate of newly reported tuberculosis cases or deaths, or in the changes in these rates. On the other hand, the States which show the largest decline in tuberculosis bed occupancy are the ones which, in general, have the greatest number of tuberculosis beds per newly reported active tuberculosis case. This relationship is apparent when the data for all States are considered. It is even more obvious when the observation is based only on those States from which information about 95 percent or more of their tuberculosis beds was available.

An analysis of official rated bed capacity indicates that the greatest average percentage decline in number of TB beds occupied has oc-

curred in the smallest hospitals. Hospitals with less than 50 beds showed the largest decrease. The average decrease in beds occupied for this group is almost 22 percent. For hospitals with between 50 and 99 tuberculosis beds, the average decrease was close to 14 percent, and for hospitals with between 100 and 149 beds the average decrease was 9 percent. Table 3 shows that this relationship extends to the groups of still larger hospitals—the larger the hospital, the smaller the average percentage decline in number of beds occupied. This is apparent when all types of hospitals are grouped by size, as well as when the tuberculosis hospitals are considered separately by size.

Tables 1 and 4 show changes in bed occupancy by ownership of hospitals. The non-Federal

groups called "other" in these tables are, for convenience, called private in the text. They are all nongovernment hospitals. This classification, however, refers to the ownership of the hospitals and not to the source of funds for the care of the tuberculosis patients. The care of some patients in nongovernment hospitals is provided at public expense. Some of the changes in TB bed occupancy in private hospitals may be due to changes in the availability of public money for the care of patients in private hospitals.

When the ownership of the hospital is considered, it is evident, as shown in table 1, that

the smallest average decline in the occupancy of tuberculosis beds occurred among the State-owned hospitals. The largest average decline in occupancy was among the private hospitals, with the local government hospitals falling in between. There is a pronounced relationship between the ownership of tuberculosis hospitals and their size. On the average, State tuberculosis hospitals are the largest, local government hospitals are intermediate in size, and private hospitals are the smallest (table 1).

There arises, therefore, the question of whether the relative changes in tuberculosis bed occupancy are associated with the hospitals be-

**Table 4. Change in number of tuberculosis beds occupied in non-Federal hospitals by size (TB rated capacity) and type of hospital, continental United States, spring 1954-fall 1954**

Size <sup>1</sup> (TB rated capacity) and control of hospital	Number of hospitals <sup>2</sup>	Number of TB beds occupied		Increase or decrease in number of TB beds occupied spring 1954-fall 1954	
		Spring 1954	Fall 1954	Number	Percent
All sizes (total).....	463	67,405	62,445	-4,960	-7.4
State.....	94	24,755	24,020	-735	-3.0
Local government.....	257	35,298	32,143	-3,155	-8.9
Other non-Federal.....	112	7,352	6,282	-1,070	-14.6
5-49 beds.....	122	2,733	2,140	-593	-21.7
State.....	4	98	103	+5	+5.1
Local government.....	70	1,680	1,306	-374	-22.3
Other non-Federal.....	48	955	731	-224	-23.5
50-99 beds.....	101	5,844	5,051	-793	-13.6
State.....	7	468	459	-9	-1.9
Local government.....	62	3,560	3,161	-399	-11.2
Other non-Federal.....	32	1,816	1,431	-385	-21.2
100-149 beds.....	76	6,997	6,365	-632	-9.0
State.....	18	1,835	1,648	-187	-10.2
Local government.....	45	4,077	3,698	-379	-9.3
Other non-Federal.....	13	1,085	1,019	-66	-6.1
150-249 beds.....	67	10,460	9,553	-907	-8.7
State.....	17	2,478	2,490	+12	+0.5
Local government.....	35	5,684	5,180	-504	-8.9
Other non-Federal.....	15	2,298	1,883	-415	-18.1
250-499 beds.....	66	19,468	18,410	-1,058	-5.4
State.....	34	9,971	9,834	-137	-1.4
Local government.....	28	8,299	7,358	-941	-11.3
Other non-Federal.....	4	1,198	1,218	+20	+1.7
500-2,999 beds.....	31	21,903	20,926	-977	-4.5
State.....	14	9,905	9,486	-419	-4.2
Local government.....	17	11,998	11,440	-558	-4.7
Other non-Federal.....					

<sup>1</sup> Intervals in this column represent the official tuberculosis bed capacity for each of the hospitals included in that interval and are different from the corresponding column in table 6, in which the intervals show the decrease in the number of patients occupying tuberculosis beds between spring and fall of 1954.

<sup>2</sup> Number of hospitals for which reports were available in the fall of 1954.

SOURCE: References 1-6.

cause of their size or because of their ownership. Table 4, while it does not present an unequivocal picture, shows that size is probably a more important determinant of the change in tuberculosis bed occupancy than is ownership. For instance, among institutions with less than 50 beds there are relatively large numbers of institutions in the categories of local government hospitals and of private hospitals. For each of these categories, the percent decrease is substantially the same. In the group of hospitals with between 100 and 149 tuberculosis beds, the State hospitals have the largest percentage decrease and the private hospitals have the smallest percentage decrease. This group is composed of a fairly large number of hospitals and a fairly large number of beds in each category. Among the large hospitals that have from 250 to 499 tuberculosis beds, the local government hospitals have the largest percent decrease in tuberculosis bed occupancy while the State and private hospitals show very small changes. In the largest group of hospitals—those that have more than 500 tuberculosis beds—the State and local government hospitals have decreases of about the same magnitude. It is interesting to notice, by way of contrast, that while the local government and private hospitals show smaller decreases in tuberculosis bed occupancy as we go up the size scale, the State-owned hospitals do not show this trend.

#### *Distribution of Closed Facilities*

Thirty-one of the 463 non-Federal hospitals which took tuberculosis patients in the spring of 1954 were closed by the fall of 1954 or had closed their tuberculosis units. These 31 hospitals had a total of 2,362 tuberculosis beds (official rated capacity). In the same period it is known that 2 new tuberculosis hospitals opened with a capacity of 470 tuberculosis beds. This resulted in a net decrease of 1,892 in the number of tuberculosis beds in the continental United States as a result only of the closing of old hospitals and the opening of new hospitals. The corresponding net decrease in tuberculosis bed occupancy is 1,341.

The 31 closed institutions were all located in 10 States; 9 of the institutions were in 1 State which has a progressive program of new

construction to replace small outmoded institutions (1, 2, 4-6).

Twenty-five of the closed institutions were tuberculosis hospitals, the majority of which were old and had a fairly small capacity for tuberculosis patients. Five of the 25 were from 51 to 86 years old; 8 were from 36 to 50 years; 10 were from 14 to 29 years; and only 2 were fairly new, 4 to 5 years old. Eleven of these tuberculosis facilities had less than 50 beds; 6 had from 50 to 74 beds; and the remaining 8 hospitals had 75 beds or more. Table 5 shows the distribution of closed hospitals by rated capacity for tuberculosis. (The size classification shown in tables 3, 4, and 5 is in terms of rated capacity for tuberculosis, as distinguished from the size classification given in table 6, which is in terms of the numerical change in the number of beds occupied.) Six of the 25 tuberculosis facilities were privately owned, 2 were State owned, and all others were owned by the local government—city, county, or district.

The remaining 6 hospitals in the non-Federal group were general hospitals which closed their tuberculosis wards. These facilities were mostly in old hospitals ranging from 35 to 61 years old, the only exception being a 14-year-old hospital. Three of the 6 hospitals had less than 25 tuberculosis beds; only 1 had more than 50 beds (table 5). All except one were owned by the local government; it was privately owned.

Twenty-four of the 31 closed institutions had less than 50 tuberculosis patients each on April 1, 1954. The other 7 institutions had 50 or more patients hospitalized on that date (table 6).

#### **Federal Hospitals**

In the 132 Federal hospitals for which data were available in the fall of 1954, there is a decrease in tuberculosis bed occupancy of 4.3 percent (table 1). One hundred and eight of the Federal hospitals (about 82 percent) are Veterans Administration hospitals in which there were 15,334 beds occupied by tuberculosis patients in the fall of 1954. This number represents 83.8 percent of the total number of tuberculosis beds occupied in the 132 Federal hospitals.

Data furnished by the Department of Medi-



**Table 5. Distribution of closed non-Federal tuberculosis facilities, by size, spring 1954–fall 1954**

Size of hospital (TB rated capacity) <sup>1</sup>	Total		Closed TB hospitals		Closed TB sections in general hospitals	
	Number of closed TB facilities	Number of TB beds occupied April 1, 1954	Number of institutions	Number of TB beds occupied on April 1, 1954	Number of institutions	Number of TB beds occupied on April 1, 1954
Total.....	31	1, 581	25	1, 481	6	100
5-24.....	6	62	3	31	3	31
25-49.....	10	218	8	185	2	33
50-74.....	7	275	6	239	1	36
75-99.....	1	40	1	40	0	0
100-149.....	3	135	3	135	0	0
150-249.....	2	250	2	250	0	0
250 and over.....	2	601	2	601	0	0

<sup>1</sup> Intervals in this column represent the official tuberculosis bed capacity for each of the hospitals included in that interval and are different from the corresponding column in table 6, in which the intervals show the decrease in the number of patients occupying tuberculosis beds between spring and fall, 1954.

SOURCE: References 1-6.

cine and Surgery of the Veterans Administration show that the number of tuberculosis beds occupied in the Veterans Administration hospitals has decreased by 2.6 percent in the 8-month period. This decrease appears to be small by comparison with the average decrease and by comparison with the decreases in some other classes of hospitals. This figure, however, reflects only the change in the number of persons hospitalized for tuberculosis in VA hospitals; it does not take account of those persons hospitalized under contract in other hospitals. The number of tuberculosis patients receiving care under VA auspices in contract hospitals has been decreasing since February 1947, and in the 8-month period between March 31 and November 30, 1954, decreased from 916 to 528. This policy of decreasing contract hospitalization and making maximum use of VA hospitals in the presence of a decreased demand for tuberculosis beds is responsible for part of the decrease in bed occupancy in other Federal hospitals and in non-Federal hospitals. Because of the effect of this policy, the average decrease of 6.7 percent for the whole United States has more meaning as a summary figure than the average decrease of 7.4 percent for non-Federal hospitals only. The total number

of patients hospitalized by VA in both its own and in contract hospitals decreased by about 5 percent.

Also of importance in connection with the demand for tuberculosis beds is reliable data about waiting lists. Although such data cannot be assembled for the whole United States, it is available for VA beneficiaries. On March 31, 1954, there were 947 such veterans awaiting admission as compared with 456 veterans on November 30, 1954. Thus, the total number of tuberculous veterans hospitalized and awaiting admission to VA hospitals was 17,614 on March 31, 1954. By comparison there were 16,358 on November 30, 1954, or a decline of slightly more than 7 percent. Here, however, one must recognize that a substantial number of patients may have obtained hospitalization elsewhere before they were reached on waiting lists.

If the VA hospitals are eliminated from the Federal data, the decline in the occupancy of tuberculosis beds in the remaining 24 Federal hospitals is 12.2 percent (table 1).

#### The Meaning of the Data

The decrease in tuberculosis bed occupancy discussed in this paper is a phenomenon of rela-

tively recent times. Previously, the trend has been steadily upward. Construction of hospital facilities solely for tuberculosis patients started just before the turn of the century. By 1904 there were fewer than 10,000 tuberculosis beds in the United States. This number increased until on April 1, 1953, in the continental United States, there were almost 110,000 tuberculosis beds in which there were more than 96,000 patients. While the number of tuberculosis beds continued to increase, the number of tuberculosis patients hospitalized, however, has shown a decline since April 1, 1953.

During the first half of the century there was urgent need for more tuberculosis beds. As tuberculosis hospital facilities were increased, the number of tuberculosis patients hospitalized increased proportionately. During this period a continuous backlog of patients exerted pressure for the construction of more tuberculosis hospital facilities. However, even with this

**Table 6. Distribution of non-Federal hospitals by change in number of tuberculosis beds occupied, spring 1954-fall 1954**

Change in TB beds occupied (number of beds) <sup>1</sup>	Number of hospitals reporting	Number of hospitals still open	Number of closed TB facilities	
			Tuberculosis hospitals	Tuberculosis sections in general hospitals
Total-----	463	432	25	6
No change-----	36	36	-----	-----
Increase-----	102	102	-----	-----
Decrease-----	325	294	25	6
1-9-----	156	154	1	1
10-19-----	68	61	3	4
20-29-----	30	26	4	0
30-39-----	28	20	7	1
40-49-----	16	13	3	0
50-99-----	18	15	3	0
100-199-----	7	5	2	0
200-299-----	1	-----	1	0
300 and over---	1	-----	1	0

<sup>1</sup> Intervals in this column represent the decrease in the number of patients occupying tuberculosis beds between spring and fall, 1954, in each of the hospitals included in that interval and are different from the corresponding column in tables 3, 4, and 5, in which the intervals represent the size (TB rated capacity) of the hospitals.

SOURCE: References 1-6.

pressure, it was considered normal for 10 to 15 percent of the tuberculosis beds to remain unoccupied.

The decreases which are apparent may be assigned to three causes: reduced demand for tuberculosis hospital facilities, seasonal fluctuation in the data, and representativeness of the reporting hospitals.

While the data available for this paper are much more comprehensive than the occasional reports about bed occupancy which were available around mid-1954, even the data used here leave much to be desired. Although the response rate was remarkably high on the whole, many States are represented by only a small proportion of the total number of beds in the State (table 2). Confidence in the results of this study must be based upon the magnitude of the response rather than upon knowledge of its representativeness. Although the response rate is quite high, we do not know whether the respondents are representative of the whole United States. Nor do we know whether the respondents in a given State adequately represent that State unless every hospital with tuberculosis beds reported in the fall of 1954. The smaller the proportion of beds reported, the less our confidence in the representativeness of the available data.

Moreover, it is not safe to assume that there is a uniform surplus of beds in a State even when all hospitals report, and when the State shows a decrease in tuberculosis bed occupancy. Even this situation may mask serious bed shortages in some parts of the State, or for some classes of patients. For instance, Missouri shows a decrease of 7.2 percent in the number of non-Federal beds occupied over the 8-month period under consideration. However, there are no beds available in Kansas City for children under 12 years of age. Children who need treatment are given limited hospitalization at the Kansas City General Hospital isolation ward. If continued care is indicated, children under 12 must be sent out of the State to a private hospital. Moreover, in Missouri, in spite of the decrease in tuberculosis bed occupancy shown by this study, there were, in October, 41 patients awaiting admission to the State sanatorium at Mount Vernon. In Kansas, which showed a decrease in tuberculosis bed occupancy

of 8.1 percent, there is usually a 3- to 4-week waiting period for admission to State hospitals. In Kentucky, which showed a small decrease of 3 percent in tuberculosis bed occupancy, there is a waiting period of several weeks.

The decrease in tuberculosis bed occupancy for the State of Alabama is so small in the 8-month period that it may be entirely discounted on the grounds of its being due to non-representativeness or to seasonal fluctuation. However, because there does appear to be a slight decrease (table 2), it is useful to notice that at the time the 1954 annual report for the Jefferson Tuberculosis Sanatorium in Alabama was written, there were more than 80 Negro patients awaiting admission to the institution (7). Mississippi also shows a very small decrease but according to the report of a Public Health Service staff member on April 18, 1955, there are 245 Negroes on the waiting list, and it is believed that this number is an underestimate of the actual number of patients waiting for beds since many applications have not been filed because of the already long waiting list.

The preceding paragraphs illustrate that a decrease in bed occupancy can occur in a given State even in the presence of a need for additional beds. It is apparent from the foregoing that these figures, at best, reflect only changes in demand. Since there is a considerable difference between demand and need, these data should not be used as a direct measure of the change in need for tuberculosis hospital beds. Moreover, more beds than are now occupied or needed would be required if tuberculosis case finding and followup were more aggressively implemented. In "Tuberculosis Case Finding in Iowa," (8) for instance, it is pointed out that three-fourths of all of the cases of tuberculosis diagnosed in Iowa during 1952 came to diagnosis "because of symptoms associated with tuberculosis." Many of these cases could have been found earlier by aggressive case finding.

A careful study in Polk County, Iowa, including the city of Des Moines, showed that about 60 percent of the 83 new tuberculosis cases discovered during 1952 and 1953 came to diagnosis because of symptoms. Moreover, for two-thirds of the cases, earlier occasions were identified when a diagnosis of tuberculosis might have been made. Forty percent of

the missed opportunities were attributed to a break in the followup procedure. It is especially interesting to note that the "missed opportunities" were identified only among the moderately and far advanced cases; none could be found for the minimal cases (9).

Additional evidence that X-ray case finding has not yet reached the limit of its usefulness is found in the facts that:

'A million and a half more case-finding films were taken in 1953 than in 1952 without a decrease in the yield of new cases resulting from the case-finding efforts (10). Moreover, 78 percent of the newly reported active and probably active cases for which the extent of disease was specified in 1953 were in the moderately or far advanced stage of disease at the time they were reported. There was essentially no change between 1952 and 1953 in the proportion of cases reported as minimal, moderately advanced, and far advanced (11).

About 5 percent of all newly reported tuberculosis cases were first made known to the health department only at the time of death (11).

## Summary

1. The overall average decrease in the number of tuberculosis patients occupying beds in all types of hospitals, Federal and non-Federal, in the continental United States, was 6.7 percent in the 8-month period between April 1954 and November 1954.

2. States which show the largest decline in non-Federal tuberculosis bed occupancy are the ones which, in general, have the largest ratios of tuberculosis beds per annual newly reported active tuberculosis case.

3. The greatest percentage decrease in number of non-Federal tuberculosis beds occupied has occurred in the smaller hospitals; the larger the hospital the smaller the average percentage decrease in number of beds occupied.

4. There is wide variation in the changes in bed occupancy in non-Federal hospitals from State to State. More States show decreases than increases; however, not all of the States which show decreases have a surplus of beds.

5. The average decrease in number of tuberculosis patients occupying beds in all Federal hospitals is 4.3 percent. The Veterans Admin-

istration hospitals, accounting for about 82 percent of the beds in the Federal group, show an average decrease in tuberculosis bed occupancy of 2.6 percent. This average becomes about 5 percent when contract hospitals are combined with Veterans Administration hospitals. The average decrease in tuberculosis bed occupancy in the remaining Federal hospitals (Army, Navy, Air Force, Public Health Service, and the former Bureau of Indian Affairs) is 12.2 percent.

#### REFERENCES

- (1) Public Health Service bed census postcard. Form PHS 697 (Rev. 4-54).
- (2) National Tuberculosis Association: Questionnaire accompanying letter C-56, November 10, 1954. New York, N. Y., The Association, 1954.
- (3) U. S. Public Health Service: Tuberculosis beds in hospitals and sanatoria, April 1, 1954. Public Health Service Pub. No. 412. Washington, D. C., U. S. Government Printing Office, 1954.
- (4) New York Tuberculosis and Health Association: Report compiled from data provided by the New York City Department of Hospitals. New York, The Association, 1954.
- (5) Washington State Department of Health: Report. Seattle, Wash., The Department, 1954.
- (6) Michigan State Department of Health: The current status of the tuberculosis problem in Michigan. Lansing, The Department, 1954.
- (7) Jefferson Tuberculosis Sanatorium: Annual report. Birmingham, Ala., The Sanatorium, 1954.
- (8) Heeren, R., Harmon, J., Iskrant, A. P., Guttridge, J.: Tuberculosis case finding in Iowa. Pub. Health Rep. 70: 367-372, April 1955.
- (9) Gelperin, A., Galinsky, L. J., and Iskrant, A. P.: Appraisal of tuberculosis case finding—Des Moines and Polk County, Iowa. Pub. Health Rep. 70: 761-767, August 1955.
- (10) Tuberculosis X-ray case-finding activities, United States, 1953. Pub. Health Rep. 70: 681-683, July 1955.
- (11) U. S. Public Health Service: Reported tuberculosis morbidity and other data, calendar year, 1953. Public Health Service Pub. No. 442. Washington, D. C., U. S. Government Printing Office, 1954.

### Institutes in Care of Prematures

Three physician-nurse institutes in the care of premature infants have been scheduled during 1955-56 at the New York Hospital-Cornell Medical Center.

The institutes, now in their seventh year, are sponsored by the New York State Department of Health and the Children's Bureau of the Department of Health, Education, and Welfare. They are designed for physicians and nurses in charge of hospital premature nurseries and special premature centers and for medical and nursing directors and consultants of State and local premature programs.

The institutes, of 2 weeks' duration for physicians and 4 weeks for nurses, start September 26, 1955; November 21, 1955; and January 30, 1956. If the number of applicants is sufficient, additional institutes will be scheduled in 1956 beginning April 2 and May 21. Each institute is limited to six physician-nurse teams.

Participants pay no tuition fee, and stipends are provided to help cover expenses during attendance.

Early application is essential in planning the institutes. Additional information may be obtained by writing: Box 143, Institute in the Care of Premature Infants, New York Hospital, 525 East 68th Street, New York 21, N. Y.

# The 1954 National Conference on Shellfish Sanitation

By E. T. JENSEN, B.S.C.E.

SANITARY control of growing, harvesting, and processing of shellfish in the United States is achieved by a unique cooperative program operated jointly by the Public Health Service, the States, and the shellfish industry.

This cooperative shellfish sanitation program had its start in the wake of a serious oyster-borne typhoid epidemic. Late in the winter of 1924, simultaneous outbreaks of typhoid fever were noted in Chicago, New York, Washington, and several other cities. In all, 1,500 cases of typhoid fever and 150 deaths in excess of the normal incidence for the disease were reported. A comprehensive epidemiological investigation implicated fresh oysters as the vehicle responsible for the outbreak (1).

The resulting adverse publicity caused sales of oysters and clams to drop virtually to zero in some areas, and the shellfish industry was soon in a state of economic collapse. To reestablish public confidence in raw, fresh shellfish as food, the industry and certain governmental agencies appealed to health authorities for assistance.

Accordingly, the Public Health Service called a public meeting in Washington, D. C., on

February 19, 1925, to formulate a plan for sanitary control of the shellfish industry. The meeting was attended by many State health officers, city health officers, and representatives of other interested State and Federal agencies and of the shellfish industry.

The result was the development of a system of shellfish sanitation which placed responsibility for shellfish sanitation with the States and which is coordinated by the Shellfish Sanitation Section of the Public Health Service.

The Public Health Service was to develop standards, conduct research, review State programs, and advise receiving States of the effectiveness of shellfish sanitation programs in the producing States. This last responsibility has been fulfilled in recent years by distribution of a periodic compilation of State-certified shellfish shippers. The program is considered supplementary to the Food, Drug, and Cosmetic Act (2), and is universally supported as necessary because of the sanitation problems peculiar to shellfish growing and harvesting. In the program, shellfish is defined to mean only oysters, clams, and mussels. The shellfish certification system does not apply to crabs, lobsters, or shrimp.

The success of the shellfish sanitation control program is indicated by the absence of major outbreaks of shellfish-borne typhoid or enteric disease during the 30 years it has been in operation. Despite this long period of successful operation there has been need for a critical re-

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*Mr. Jensen is the acting chief of the Shellfish Sanitation Section, Division of Sanitary Engineering Services, Bureau of State Services, Public Health Service, Washington, D. C.*

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view of the shellfish certification system by participating organizations. This need resulted from technological advances in food-handling methods and from the realignment of State health department environmental sanitation activities.

### **To Review Certification Program**

The Association of State and Territorial Health Officers, at its 1953 meeting, adopted a resolution calling on the Public Health Service to sponsor a conference for review of the shellfish certification program.

Acting on this request, the Surgeon General of the Public Health Service invited State and Federal agencies, the shellfish industry, and the Canadian Government, because of our interrelationship with Canada's shellfish certification program, to send representatives to the National Conference on Shellfish Sanitation, in Washington, D. C., September 9 and 10, 1954. The chief and deputy chief of the Bureau of State Services, Public Health Service, presided at the conference.

The conference was attended by 8 State health officers, 28 representatives from State agencies having interests in shellfish sanitation, and 20 from the shellfish industry. Four members of the Canadian Government were present. Our Government was represented by officials from the Department of State, the Department of Interior (the Fish and Wildlife Service), and the Department of Health, Education, and Welfare (the Food and Drug Administration and the Public Health Service). Only 3 interior States were represented; there were no representatives from the east coast clam industry.

To achieve an orderly discussion of all major topics, a 14-member representative committee had prepared an agenda, which included:

- Problems in sanitary control of shellfish production.
- Problems in sanitary control of shellfish marketing.
- Public Health Service participation in shellfish sanitation activities.
- Different sanitary regulations for intra-state and interstate shellfish shippers.
- Importation of shellfish.
- Classification of growing areas.

- Need for specific sanitary requirements for various species of shellfish.

- Future operations of shellfish control programs.

Discussion of these topics led to several general conclusions, most important of which was the indication of satisfaction with the cooperative control program which was expressed by all present at the conference. It was apparent that everyone concerned with shellfish sanitation was convinced that the certification system had been most effective in controlling the spread of shellfish-borne disease and that the system should be continued.

The problem of maintaining interior State interest in shellfish certification was discussed at length, but no conclusion was reached regarding a method of obtaining such interest. The question of breaded-shellfish certification was similarly discussed, but no positive conclusion was reached. However, it was apparent that there was a division of opinion on need for certification of prepared shellfish products. Several State representatives stated there was insufficient public health justification for extending certification to the breaded product.

While it was decided that problems related to shellfish importation (3) should be further discussed among the interested Federal agencies, the State representatives were unanimous in their opinion that shellfish imported into this country should meet the same sanitary standards as required for domestically produced shellfish.

### **The Future of the Program**

The following resolution, unanimously adopted, expresses the sense of the conference:

Whereas, to safeguard public health, there is a continuing need for a program for sanitary control of shellfish processing and distribution in receiving areas, and

Whereas, the establishment of adequate control measures in both producing areas and receiving areas will assist the shellfish industry and provide protection for the ultimate consumer, therefore, be it resolved:

1. That the present policy of Federal-State and industry cooperative relationship be continued, including the listing of certified shell-

fish dealers by the United States Public Health Service, based on its endorsement of the various States' programs.

2. That the Public Health Service develop specific minimum requirements for endorsing States' shellfish programs, which shall take into account varying geographic and other conditions and the various species of shellfish grown therein.

3. That the certification of shellfish packers and repackers, with endorsement of satisfactory State programs by the United States Public Health Service, be developed in all receiving States.

4. That all States be encouraged to require that only shellfish from certified dealers be permitted to be sold.

5. That the program for sanitary control of the shellfish industry be maintained throughout the year in both producing and receiving States.

6. That the Public Health Service maintain a staff to carry out its responsibility in this program, including the necessary research and consultation service.

Action to implement the several sections of the resolution will be initiated by the Public Health Service. However, the ultimate measure of value of the shellfish certification program will be determined by the States' action in refusing to accept shellfish having a questionable certification status.

#### REFERENCES

- (1) Lumsden, L. L., Hasseltine, H. E., Leake, J. P., and Veldee, M. V.: A typhoid fever epidemic caused by oyster-borne infection (1924-25). Pub. Health Rep. Supp. No. 50.
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## Syphilis Serology Courses

Nine laboratory refresher courses will be offered at the Venereal Disease Research Laboratory of the Public Health Service in Chamblee, Ga., September 1955-May 1956.

Six of the courses cover the serology of syphilis in general. They include lecture, demonstration, and participation classes in the most widely used American methods for the serodiagnosis of syphilis, including the latest developments. They are to be held on the following dates:

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courses offered October 31-November 10, 1955, and April 16-27, 1956. There will be some class participation in the complement fixation, agglutination, and other such tests.

A course in the management and control of syphilis serology by the regional laboratory, designed for assistant laboratory directors and senior laboratory staff members, is scheduled for April 30-May 11, 1956.

Applications for any of these must be signed by a State health officer or laboratory director, or by a medical officer in charge in the Public Health Service. Application forms may be obtained by writing to: Director, Venereal Disease Research Laboratory, Division of Special Health Services, Public Health Service, Department of Health, Education, and Welfare, P. O. Box 185, Chamblee, Ga.



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#### REFERENCES

- (1) Lumsden, L. L., Hasseltine, H. E., Leake, J. P., and Veldee, M. V.: A typhoid fever epidemic caused by oyster-borne infection (1924-25). Pub. Health Rep. Supp. No. 50.
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*Air pollution, chronic illnesses, radiological health, dental health, and accident prevention call for fresh activity in a State occupational health program.*

# Potential of an Occupational Health Program in a State Department of Health

By DANIEL BERGSMA, M.D., M.P.H.

FIFTEEN YEARS AGO, when a program of industrial hygiene was started in the New Jersey State Department of Health as a Public Health Service demonstration, we learned the credo of preplacement physical examination, engineering control, and industrial hygiene toxicology. These items form the foundation stone of occupational health activities today, but they are only the foundation stone. Upon them can be built a superstructure that reaches into many areas of public health and community life.

## Informing Community Groups

One of the great untapped potentials in occupational health is the informing of community groups who have an interest and responsibility in the health and welfare of the working population. Henry Doyle, chief of the Public Health Service's Occupational Health Program, has stated the unfortunate truth and

the remedy: "It is generally recognized that the public . . . knows relatively little about what the government is doing to protect the health of the worker. In creating a climate of favorable opinion and action, publicity can serve as an invaluable tool."

Office memorandums, reports of field trips, letters to plant owners or plant managers are all an integral part of an official occupational health program, but these writings should not be the ultimate repository of all the staff's knowledge; neither should the technical paper nor the technical conference. It is the duty of every person engaged in an official health activity to translate his information, his special skills, and his achievements into terms that the community can understand. Then, administrative channels of communication must be established and so managed that the information reaches the public and the public is motivated to make use of it. Time consuming though it may be, the personnel of an occupational health unit must be ready and willing to teach at colleges or universities, to participate in industrial work shops, and to speak at association meetings and community forums.

As an example of such an activity, staff members of the New Jersey State Department of Health will soon present a lecture-demonstration at the annual meeting of the New Jersey State Bar Association. The presentation,

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*Dr. Bergsma, who joined the New Jersey State Department of Health in 1938, has been commissioner of health of New Jersey since the creation of that title in June 1948. This paper was presented before the 1955 Industrial Health Conference at Buffalo, N. Y., on April 26.*

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which is entitled "Methods of Prophylaxis and Diagnosis of Occupational Diseases," has been meticulously worked out to demonstrate the physician-engineer-chemist team work approach. Thus, while admitting that much still remains to be done in public health medicine, we are preparing to invade one fringe of the law relating to public health.

### Coordination With Other Programs

Recognizing that the worker has a place of residence as well as a place of work and that he is usually part of a family group, New Jersey's program of industrial hygiene was expanded to the program of adult and industrial health more than 7 years ago. The current name is adult and occupational health, which expresses the present-day philosophy of man as a total integrated human being.

With this view of man, it seems to me that plans for an occupational health program should be based upon coordinated public health practices. I believe that almost every activity in public health or preventive medicine could be improved by coordinating it and occupational health. In some instances, the occupational health program should take the initiative in organizing such joint effort.

Air pollution control, which is creating a pressing problem for most health departments, is one activity that might well be coordinated with occupational health. Rightly or wrongly, industrial installations are often accused of being the perpetrators of the crime of air pollution. In any event, an investigator who knows what is going on inside an industrial plant is in a particularly advantageous position to know what is coming out of it. Since this knowledge is in the hands of the occupational health unit, this unit is one logical place for a health department to organize an air pollution control program.

But, of course, industrial air effluent is not the only cause of air pollution. Pollens, for example, are often a significant part of the total picture. Therefore, if the occupational health unit is responsible for air pollution control, it will need to coordinate its work with that of the unit in charge of pollen sampling and eradication of ragweed.

A recent study in New Jersey of house paint discoloration allegedly caused by a nearby rubber industry revealed that the agent of the discoloration was mildew. We have no bureau of fungus control in the New Jersey health department, but I am happy to delegate this function to the adult and occupational health program.

With the exception of berylliosis, specific disease syndromes from air contaminants are difficult to establish. It has been said that an epidemiological study extending over 20 to 30 years is necessary for a determination of the long-term effects of air contaminants. Such a study must obviously be a coordinated project of the programs for occupational health, chronic illness control, and vital statistics. In the study, morbidity and mortality records, multiphasic screening to detect chronic diseases, and air sampling would be of equal importance.

Having once joined forces with the chronic illness control program, the vital statistics unit, and other health department activities, the occupational health program should be ready and willing to cooperate with them in the use of every available resource to restore and enhance the health of the community. The newer multiphasic screening techniques furnish an excellent means by which the occupational health program may assist in the development of a positive adult health program. Through education and demonstration efforts designed to initiate preplacement and periodic physical examinations in industry, it can be emphasized that industrial medical services are preventive not only for occupational diseases but for the far more numerous nonoccupational illnesses that afflict industrial workers.

Tuberculosis, diabetes, heart disease, cancer, and venereal disease are among the disorders that can be revealed by relatively simple methods. Every industrial plant should be encouraged to expand the spectrum of its preplacement and periodic physical examinations so that symptoms of these diseases may be detected. Proper facilities may be available at the plant, mobile units may be used for demonstrations, or employees may go to community health centers.

Mass serologic testing programs to uncover venereal disease can easily be performed in in-

dustrial plants either by community public health personnel or by plant medical personnel. Such programs can be stimulated by the staff of the adult and occupational health program, and proper followup and treatment of any cases detected, as well as the tracing of sources and contacts, can be assured through coordinated effort.

Following the development of cancer detection services, industrial plant management should be encouraged to have employees participate, especially those employees 45 years of age and over. In industrial areas where cancer mortality or cancer morbidity of a specific type increases suspiciously, personnel of the adult and occupational health program should be requested to visit the plant and to conduct studies to determine the presence of known or suspected carcinogenic agents. In the present state of our knowledge, the environmental and occupational carcinogens compose the only phase of cancer control in which true prevention can be a fact.

### **Radiological Health**

Any current discussion of cancer control as a public health activity leads one to problems of radiological health. Radiation is an excellent example of a two-edged sword. It can be used to detect and treat new cancer growths, but, also, it has definitely been incriminated as a prime agent in the causation of cancer of the skin, the bones, the lungs, and the blood. The increasing use of radioisotopes and all other sources of ionizing radiation has created the need for organized public health programs in radiological health. Personnel willing to be trained, and capable of being trained, in the new science of nuclear physics are found in occupational health units.

Industrial X-ray machines, industrial radiography using radium or cobalt-60, static eliminators, beta gages, and tracer uses of a variety of radioisotopes have been the initial stimulus for expanding industrial hygiene techniques into the field of radiation. However, the public health problem is larger and more complicated than industrial utilization of ionizing radiation. X-ray machines for diagnosis and therapy, radioisotopes for research and for treatment, detection, and localization of path-

ology, fluoroscopic shoe-fitting machines—all these increase the radiation exposure of the general public and make necessary education in the safe handling of these items and varying degrees of regulation and control.

It has become one of the functions of New Jersey's adult and occupational health program to administer all phases of radiological health. The most effective way to reach professional groups has proved to be through the health department's medical programs. Monitoring of mobile chest X-ray units and of tuberculosis clinics, heart disease clinics, and multiphasic screening installations has impressed physicians, nurses, technicians, and local health department staffs with the basic principles of good radiological methods. It is, of course, not adequate for the occupational health representative to perform the required instrumentation, make a report, and then depart. Unless he learns something about the incidence and prevalence of disease in the community and obtains a working knowledge of what the radiation procedure is expected to accomplish, he cannot draw valid conclusions concerning the justification for a single radiation exposure as extensive as that used in angiocardiology or for the repeated exposures used in suspected or arrested cases of tuberculosis, for example.

### **Approaching the Second Milestone**

What I have discussed so far is about the extent of the progress made by our occupational health staff. We have not limited ourselves to strict routine; on the other hand, we have not utilized all the tools available to a State health department.

The New Jersey State Department of Health is well past the first of the two industrial hygiene milestones cited by Victoria Trasko (1)—the acceptance of industrial hygiene as a public health responsibility. The second milestone, the broadening of the concept of occupational health to embrace the total health of the worker, is just within sight on the horizon. To some degree, we are plagued by the usual shortages of personnel, equipment, and operating funds. Nonetheless, by maximizing cooperation with other health department programs, I am sure that the occupational health program could do

a better job without undue strain on present personnel.

One of the possibilities for further expansion is the coordination of occupational health and the dental health program. It is well known that a healthy oral cavity has a direct constructive influence on industrial production and, conversely, that an oral infection has an adverse influence. "An aching tooth in an individual can become a company's toothache affecting not only the well-being of the individual but jeopardizing the safety of fellow employees. Pain of dental origin causes loss of sleep, fatigue, and mental distraction. Accidents follow . . ." (2).

I can visualize a two-way process in which the public health dentist makes a contribution to occupational health and the occupational health staff expedites basic dental health activities. The services of the public health dentist may be enlisted to provide educational material for industrial employees as to the value of routine periodic dental examination. By virtue of his contact with State and county dental societies, he is also in a position to supply information concerning community dental resources. He may even contribute more directly by becoming the consultant on oral pathology due to specific occupational materials. In turn, the occupational health staff can assist in the encouragement of fluoridation by demonstrating that fluorides have been handled in industry for many years without the occurrence of toxic effects when adequate precautions are taken. This information properly and personally supplied by an occupational health physician or an industrial engineer or toxicologist would carry considerable weight in quieting the fears of those who suspect that fluoride in water constitutes a latent hazard.

Impaired hearing is another area in which the occupational health program may work constructively with other groups. Occupational hearing loss is one of the newer and more popular concerns of the industrial hygienist. Impaired hearing and speech defects in children receive attention in maternal and child health programs and in programs for handicapped children. Pooling the efforts of these programs should afford a considerable increase in the knowledge of hearing changes that occur with advancing age. It should also suggest to

the busy industrial hygienist that rehabilitation of persons suffering hearing loss is often possible for adults as well as for children.

Additional areas for investigation become apparent as occupational health is coordinated with the maternal and child health program. One of these concerns the common household substances which have proved dangerous, and even lethal, to children and the unwary housewife. The industrial toxicologist member of the occupational health team is preeminently qualified to discuss the hazardous components of cleaning fluids, bleaches, insecticides, and other substances and, with the industrial physician, to prepare a schedule of emergency treatments. The maternal and child health personnel, through their contacts with parent-teacher associations, women's clubs, and child care clinics, are in a position to spread the word.

A second joint project for occupational health and maternal and child health, one which I have not seen described elsewhere, concerns the probable special susceptibility of the pregnant woman to toxic materials, such as the chlorinated hydrocarbons, benzol, and radiation. The health department frequently receives requests from industrial plants and labor unions for information concerning the employment of pregnant women. The occupational health staff should have more to offer than the ordinary rules about rest periods and sedentary occupations.

Accidents and accident prevention have only recently begun to attract the attention of health departments. The accident-prone individual in industry has been described as careless, tired, nervous, worried, or in conflict with society. The problem of accidents in industry can be handled to some extent by health counseling, but actually it is part of the larger problem of community mental health.

Community agencies offer valuable resources for assistance with personal problems or health counseling. The occupational health staff might well investigate the community facilities that can assist the disgruntled, accident-prone individual or the individual who seeks escape by way of alcohol. Familiarity with the tenets of mental health will help in solving the problem of the tired, listless worker, whose emotional difficulties often arise from an unsatis-

factory environment. An employee's loss of satisfaction with his job added to his distrust of the society in which he lives and works may well result in fatigue, indifference, or illness. This concept of the emotionally disturbed worker underlies what has been called by some industrial hygienists human engineering. I think what is needed is the promotion of mental health, and I believe that mental health should be the responsibility of community organizations.

### Strengthening Local Health Departments

Assistance in dealing with the problem of accidents is not the only way in which the community can contribute to occupational health. In fact, it is not expected that a State health department staff will be large enough to provide direct services on the community or local level. Perhaps the outstanding responsibility of a State health department is to strengthen local health departments and to provide them with consultation and ancillary services sufficient for them to administer direct services in their own jurisdiction.

The Committee on Scope of the American Public Health Association's Occupational Health Section has taken this stand on occupational health activities by local health departments (according to the committee's report at the 1954 meeting of the association): "The committee feels that there is an untapped reservoir of opportunities in occupational health at the local health department level. Not only in the development of pure industrial health activities by local health departments, but the use of occupational groups as a medium for the application of traditional health department functions needs to be exploited. For example, how many communities are there where industrial opportunities for the application of immunization programs, of adult health programs, of communicable disease control activities, etc., have been fully or even initially developed?"

When local health departments can be persuaded to attempt even minimal occupational health activities and to include industrial establishments and workers in their general health programs, a beginning will have been made

toward solving the problem of medical services for small industrial plants. Strong community organization may well supply the impetus for better health care for all members of the community. The State occupational health personnel must be ready to provide information, demonstrations, and technical assistance.

### The Fullest Potential

The aforementioned activities are only a few of the projects that may be classified as potentials for an occupational health program in a State health department. New Jersey is a small State, densely populated and highly industrialized, with a great diversity of industries. It could well serve as a clinic for studying preventive medicine and the adaptation of the adult to the complexities of today's social order.

This fall, Seton Hall University will open the doors of its new school of medicine, the first medical school in the State. I am hopeful that before long the curriculum will include courses in industrial medicine and occupational health. No physician practicing in New Jersey can fail to have among his patients many whose lives have been influenced by industrial processes.

I was much impressed by Dr. Jean Spencer Felton's address, "Increasing the Awareness of Occupational Medicine in a Medical Center" (3). Every topic that Dr. Felton discusses—industrial health lectures, plant tours, multiphasic screening, rehabilitation, job placement of the handicapped, and, last but not least, community orientation—could well be adopted by a State health department. Not until an occupational health program, either alone or in conjunction with a medical school or university hospital program, has assimilated and coordinated all these functions will it have reached its fullest potential.

### REFERENCES

- (1) Trasko, V. M.: Industrial hygiene milestones in governmental agencies. *Am. J. Pub. Health* 45: 39-46, January 1955.
- (2) Humphrey, R. I.: Dentistry in industrial health programs (abstract). *Indust. Hyg. Newsletter* 8: 8, February 1948.
- (3) Felton, J. S.: Increasing the awareness of occupational medicine in a medical center. Chairman's address. *J. A. M. A.* 156: 1240-1244, November 27, 1954.

# Approaches to the Quality of Hospital Care

By MINDEL C. SHEPS, M.D., M.P.H.

**I**NCREASING ATTENTION is being paid to the problems of improving and of appraising the quality of health services in general (1-8) and of hospital care in particular. The general problems of measurement and evaluation in all these areas are similar (9-16). Basically, they involve finding valid and reliable measurements of quality and interpreting these measurements when made.

## Purposes of Hospital Evaluations

Evaluations of hospital quality may have different purposes. The methods and standards selected must be related to the particular purposes for which they are being applied. The most familiar purpose is regulatory. Such an appraisal is designed to match an institution against specified standards that determine its acceptability for the purposes of the regulatory or accrediting agency. It is intended to correct abuses and raise the general level to an acceptable minimum. Various national bodies, now united in the Joint Commission for the Accred-

itation of Hospitals, have evolved minimum acceptable levels of facilities, equipment, administrative and professional organization, and professional qualifications. They have also made use of some numerical indexes of organization and performance. All of these have been set forth in the commission's Standards for Hospital Accreditation.

The requirements of licensing boards, health insurance funds, and other organizations serve a similar purpose. Regulatory appraisals set minimum or desirable levels by excluding institutions that fail to qualify. At the same time, this provides protection for patients and students who go to acceptable institutions (17-20). As yardsticks, these standards have one division that divides hospitals into two classes only—good enough or not good enough.

## *Improvement of Quality*

The second purpose of appraisals is a closely related one—that of serving as a stimulus for the improvement of quality. Licensing and accrediting assessments serve this purpose as well as that of regulation. Hospitals also make self-appraisals for this purpose. The standards used may be minimum or optimum levels, similar to those used for regulatory purposes, or may provide for comparisons among physicians in the same institution. One of the chief instruments for such appraisals has been the medical audit (21-25).

The basis of the audit is a review of hospital records according to such criteria as qualitative judgments of the care given and examination of diagnostic errors (26-29), as well as such numerical indexes as mortality rates, rates for the

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*Dr. Sheps is research associate, department of biostatistics, Harvard School of Public Health, and lecturer on biostatistics, Boston University Medical School. She presented this paper at a joint session of the Medical Care Section of the American Public Health Association and the American Association of Hospital Consultants at the 82d annual meeting of the APHA in Buffalo, October 14, 1954. A news summary of Dr. Sheps' paper appeared in the February 1955 issue of Public Health Reports, p. 198.*

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incidence of specific complications, removal of normal tissues at operations (30-32), consultations, cesarean rates, and the rates for certain tests by diagnostic category. The term "professional service accounting" has been suggested for the compilation of these rates and "medical audit" for their evaluation.

### *Program Evaluation*

The third, and more recently recognized, purpose for quality appraisal, is to study the effects of specific programs or procedures on the quality of care. Generally we may refer to this purpose as program evaluation. Certain procedures, such as clinical-pathological conferences, are believed to improve the quality of hospitals. Large-scale complex programs, such as regionalization, are under trial. It is essential that their effectiveness be examined. We need to know in detail the effect of such procedures on the care received by patients. Program evaluation is the attempt to study this effect, by seeing whether a difference or an improvement in quality is associated with a certain procedure or program.

In other situations the purpose of a program evaluation may be to see whether a certain institution is giving "good" care. Such an appraisal is basically an evaluation in which the judge compares what he finds with what in his mind seems desirable and possible.

For regulatory purposes, it is desirable to establish criteria which actually do differentiate between acceptable and unacceptable institutions. They must be discriminating at the level where the regulating agency feels the line must be drawn. To help in improving the quality of hospital care, the criteria used must discover the most important problems and reflect progress in meeting them. Criteria used for these purposes may be useful in program evaluation, but more refined measuring tools are also needed. A scale which only says "good enough" or "not good enough" is inadequate. What is needed is a scale that measures values along a continuum extending from one extreme to the other. The measurements used must be sensitive to those aspects of hospital quality that may be affected by the program.

Reference has been made to some of the standard methods in use. It has recently been stated

that the statistics used in judging hospitals are "usually meaningless, often illogical and frequently unscientific" (33). For example, post-operative mortality ratios are based on deaths within 10 days divided by the total number of operations performed. Thus, deaths after 10 days are omitted, and on the other hand procedures of varying risks, such as dental extractions and neurosurgery, are indiscriminately lumped together.

Moreover, there is a question regarding the validity of the standards by which some of the indexes are evaluated (33-36). A top limit of 3 to 4 percent is set for cesarean sections, but current clinical practice and results justify consideration of a higher level. Many of the standards were derived empirically, and their validity was not adequately established. Progress in clinical practice, in any case, calls for frequent revision and revalidation of the standards. The standards to be used, therefore, should be at levels which move according to changing medical knowledge.

The American College of Surgeons and the Professional Activity Study Group in Michigan are cooperating on a new approach to the audit as a measuring device and on the development of new indexes (36). A number of new indexes of hospital or medical care have recently been described (37-39). Studies currently in progress in the Rochester Regional Hospital Council, the North Carolina General Practice Study, and the Boston Evaluation Study may produce other indexes.

Other methodological developments of interest have been the application of the time study technique to hospital nursing (40) and a statistical analysis of the items included in hospital licensing regulations (41).

### **Problems of Measurement**

Hospital care is multidimensional. It is a service provided by a coordinated group of professional, technical, and other workers under the direction of a physician. The quality of the care received by patients is affected by the adequacy of the hospital facilities and their maintenance, by the administrative and professional organization of the hospital, by the competence of the personnel, and by the inter-



personal relations among the staff as well as between the staff and the patients.

Any consideration of evaluation, therefore, must recognize the large number of factors involved in patient care. It has been frequently suggested that an appraisal form for hospital quality be developed. Some have extended this concept to include deriving a final score or number to represent the quality of a given hospital. Such a composite index would obscure important differences. Moreover, it would be impossible to choose the items to be included and the relative weights for them on a basis that was generally applicable. On the other hand, a number of measurements can be made and each of these allowed to stand by itself, thus producing a profile of the hospital (42). We do not try to represent the health status of an individual by a single figure such as 90 percent of the optimum, but rather, we say something like:

"This patient's health, in general, is excellent, except for mild obesity and a hemoglobin of 10 grams."

Similarly, would it not be meaningful and helpful for the final report of a study to state not that "the quality is good" but rather something of this sort:

"Differences found in the following indexes were highly significant . . . No differences were observed in . . . The quality of physicians' services was significantly higher . . . The differences in social service were not significant . . ."

An exhaustive discussion of all the aspects of hospital care that could be included in such a profile will not be attempted. Instead it is proposed to deal with some of the methodological problems involved.

The main techniques used in appraisals of hospital quality can be divided into:

- The examination of prerequisites or desiderata for adequate care.
- Indexes of elements of performance.
- Indexes of the effects of care.
- Qualitative clinical evaluations.

#### *By Set Standards of Care*

According to the first approach, it is assumed that it is possible to select prerequisites for adequate care and that improvement of these fac-

tors leads to improved care. These prerequisites are minimum or optimum levels of facilities, equipment, professional training, and organization. As examples we may mention:

- The provision and appropriate maintenance of adequate physical facilities.
- The existence of special facilities, such as blood bank, bone bank, special laboratory and diagnostic facilities, premature nursery, and artificial kidney.
- An effective organizational structure, both administrative and professional.
- Standards and functioning of service departments such as records, laboratories, and libraries.
- Numbers of personnel by size of hospital—interns, residents, nurses, social workers, physical therapists, nutritionists, technicians.
- The availability of specialized personnel for consultation and of facilities for consultation with others, as in certain regional programs.
- Arrangements for ward rounds, refresher courses, continuing education.
- Minimum qualifications of personnel.
- The existence and functioning of internal controls, such as tissue committee, obstetrical committee, and medical audit.

The use of this approach implies the hypothesis that, given certain facilities and standards, the desirable quality of care is achieved. This hypothesis should be recognized and tested explicitly so that valid criteria can be used in a more informed fashion and to better purpose.

Consideration of the norms used for these desiderata raises such questions as, should they be national averages, regional averages, minimum adequate levels or optimum levels, or, should the search for standards be abandoned and the findings on various hospitals simply compared with each other? The answer depends partly on the purpose of the appraisal. In program evaluation, for example, it may be preferable to use flexible indexes applicable to different types of hospitals and to different periods, rather than to adopt any fixed standard of desirability.

Similar considerations led Stouman and Falk (10), in their proposals for international health indexes, to abandon the search for standards. If one has valid measurements for a characteristic, then intelligent, directed appli-

cation of these measurements in some situations will provide useful information as to their variability and their significance without a norm.

The argument will perhaps be made clearer by an example. When we use an index such as weight of children, we need a knowledge of norms to assist in diagnosis of a particular child. However, if we want to test the effect of a certain vitamin on weight, we need to compare the gains made by children receiving the vitamin and those not receiving it. Knowledge of the norms is here irrelevant.

### *By Elements of Performance*

The second approach to quality uses indexes intended to reflect one or more elements of performance. Indexes may be defined as "one or a set of measures . . . used to measure indirectly the incidence of a characteristic that is not directly measurable" (43). Patient care is such a characteristic. Its quality cannot be measured quantitatively, except by the arbitrary allotment of a certain number of points to a qualitative judgment. It is difficult to define; it is complex and intangible. It is therefore natural and logical that much of the effort to evaluate this quality has been focused on the development of indexes, for example:

- Utilization rates for specific procedures by category, such as admission chest X-rays as an index of preventive services, or rectal examination in specified groups of patients.
  - Utilization rates of certain laboratory and other diagnostic procedures, by category.
  - Indexes which would reflect the promptness and discrimination with which new procedures or drugs are used in the hospital.
  - Referral rates and patterns.
  - Autopsy rates.
  - Cesarean rates.
  - Pathological reports on surgical specimens.
  - Correlations between preoperative and post-operative diagnoses and between ante-mortem and post-mortem diagnoses.
  - Accuracy of diagnostic procedures.
  - Average length of hospital stay by diagnosis.
- It may be hypothesized that in a well-organized service where the staff members work with purpose and integration, hospital stay will be shorter, on the average, for certain types of cases.

• Listing specific diagnostic and therapeutic procedures expected for each type of case and matching records against them.

Good indexes are objective, reliable, and valid. By the reliability or precision of a measurement, we mean the degree of agreement among repeated measurements of the same things. Numerical indexes, such as rates or ratios, would appear to be relatively precise—anyone counting the number of autopsies done out of all hospital deaths should get the same rate provided that a hospital death is defined without ambiguity. Reliability is more difficult to achieve in indexes that require measurement rather than counting, as has been shown when different physicians measure the same enlarged livers (44), or the same reactions to tuberculin tests (45). Agreement on interpretation of X-ray films, even when repeated by the same physician, is far from perfect (46). Quality indexes that depend on such assessments or on diagnosis, however made, must be tested for precision. It is an error to assume that because they are numerical they are precise.

The use of these performance indexes depends on an assumption that they are valid for an assessment of hospital quality. Presumably this involves the hypotheses (a) that each index does measure an element of patient care, and (b) that one or a number of these indexes are highly correlated with the intangibles of care. These hypotheses can and should be examined in the light of clinical information and by statistical analysis.

Again, the desirability and validity of the yardstick for these indexes must be examined. We can all agree that the higher the proportion of correct diagnoses, the better the quality of medicine. But what proportion ought we to expect in 1955 in different hospitals?

Other standards are even less definite. There can be too many laboratory tests as well as too few; too few cesareans as well as too many. Discriminating standards would be based on studies of the relation between good patient care and the resultant number of procedures by category of case. The development of appropriate yardsticks thus involves studies to estimate desirable levels for the various indexes and the expected variation. These levels should be adaptable for different types of hospitals

and capable of reflecting progress in clinical medicine.

### *By the Effects of Care*

A third approach to appraising hospital quality is the use of indexes intended to measure the effects of quality of care on patient health. The outcome of specific therapy is influenced by many factors in addition to that of treatment, factors such as age, sex, nutrition, stage of the disease, and the emotional state of the patient. The use of these indexes may therefore be highly misleading. It necessitates a careful evaluation of concomitant factors and an attempt to control them.

Some instances of such indexes are in fairly common use. They include:

- Specific mortality ratios such as postoperative, puerperal, and neonatal.
- Survival rates of premature infants in a specified weight range.
- The incidence of preventable complications such as postoperative infections.

These indexes would seem to be relatively precise if their basis is carefully defined. A postoperative mortality rate depends only on the careful definition of postoperative deaths and of the types of surgery counted. However, the validity of this rate as an index of the quality of surgery would still need to be established. The definitions used are highly relevant to this validity. But even then questions remain:

Does the death rate within 10 days after major chest surgery really reflect the quality of care?

What about the effect of such patient characteristics as diagnosis, complicating illnesses, age, sex, and nutritional status?

Objective indexes of the kinds discussed therefore require careful definition and evaluation. They hold considerable promise for the appraisal of hospital quality, but they are not yet the ideal measuring tools. At best, they are indirect and partial indicators of the basically intangible characteristic with which we are concerned. In a given organizational setting, with access to given standards of consultation and services, doing a certain number of laboratory examinations, one can have numerous shades in the range of quality of care, depending on the skill, the judgment, the experience and the

character of the persons involved and on their relationships with patients. This end product is what one really is trying to evaluate in any assessment of patient care. It is for this reason that some workers have tackled the problem of evaluating quality directly through the fourth approach, namely a clinical evaluation.

### *By Clinical Evaluations*

Makover (47) included a clinical evaluation in his study of medical groups associated with the Health Insurance Plan of New York. The continuing HIP evaluation program has adapted some of his techniques as well as adding new ones. According to a preliminary unpublished report by M. A. Morehead, delivered at the 1954 New England regional meeting of the American Public Health Association, records from six clinical fields are selected and scores assigned on the completeness of records, diagnostic management, treatment, and reporting. Although performance is measured against prepared standards, the final score depends on the judgment of the consultant making the evaluation.

More recently, another type of combined appraisal was made by Goldmann and Graham (48). To an analysis of the availability of service and utilization of service, they added qualitative ratings of the efficiency of service organization and of a random sample of patient records.

Clinical evaluations are in the end subjective and thus less precise than some of the indexes previously discussed. However, they may be more valid since they are a direct approach to the characteristic we want to evaluate, the quality of patient care. Quality, though intangible, is not an abstraction. Nor is judgment of quality capricious or a purely personal whim. While agreement could not be expected to be complete, there are, in numerous situations, widely accepted concepts of what is meant by good care.

The reliability of qualitative judgments can be tested, and they can be subjected to statistical analysis (49-51). To make relatively precise estimates of quality, it is necessary to have the findings of several independent judges. This permits an assessment of the degree of agreement among judges (52, 53); it allows for an

objective test of the reliability of the evaluations and diminishes the effect of individual bias. Although more difficult than assessing the precision of interpretations of objective tests, it is the same in principle.

At times, agreement on judgmental evaluation is better than agreement on definitions and criteria. Reynolds (44) describes such a case. A group of clinicians attempting to outline criteria for ambulation of patients with infectious hepatitis could not reach agreement after a lengthy discussion of weighting procedures. But analysis of "paired comparisons" by which each man gave his preferences between the criteria in all possible combinations of two, resulted in good agreement on the ranks to be assigned them. Thus, it may be that several clinicians would agree more readily on the relative ranks of a number of hospitals than they would on the weights to be given various objective indexes in computing a quality score.

Judgmental assessments are resorted to in other fields. In some food industry situations the taste of a product must be evaluated. Objective tests give some information, but to answer the important question, "how does a particular process affect the taste," one must in the end resort to tasting the food. If it is necessary to study the effect of different ingredients and preparation procedures on the palatability of ice cream, the only way out is to ask a number of judges which product tastes better to them.

From such tests, valid results may be obtained notwithstanding the problems related to non-agreement among a group of judges and the lack of consistency on the part of an individual judge. The validity is also dependent on such controls as randomization of the tests and the judge's ignorance of which particular product he is testing.

Accordingly, it would appear that appropriate experimental and statistical procedures would enable more meaningful results to be obtained from qualitative evaluation of hospital care. In general, qualitative judgments are expressed through either ranking or scoring.

In ranking, a number of units are placed by each judge in order of his preference and the various ranks analyzed for consistency.

In scoring, a scale of quality is established,

and each judge assigns the score that he considers appropriate.

These techniques may be combined in various ways. Thus, individual scores can be given on quality in different clinical fields, and the findings combined into one overall score. The subjects may then be ranked according to the scores obtained.

As already emphasized, the use of these techniques depends on replication, that is, on securing at least two separate evaluations of the same set of units. This is not the same as asking a committee to make a combined appraisal. Only through separate evaluations is it possible to assess the consistency of the individual judgments and to arrive at a relatively unbiased estimate. The value assigned results from combining the different judgments, and is more reliable and objective than the opinion of a single individual. A committee of experts would emerge with one final appraisal, but this would not allow the internal checking suggested. It is even possible with such a panel that one or two members could influence the others so that the final assessment would not be truly a consensus.

If qualitative appraisals of hospital care are made, the particular aspect of care to be studied might be medical, surgical, obstetrical, nursing, social work, or a combination of these and others. Well-qualified, experienced practitioners in the field under study should make the evaluation. Although most clinicians, medical and other, would probably prefer to base their opinions on actual observations of patient care, a properly selected random sample of clinical records may provide adequate information. If various clinical fields were reviewed, replication would be desirable in each field. The evaluations in the major clinical fields could then be crosschecked to test the consistency among them.

It is obvious that such qualitative judgments would have meaning only as comparisons among different hospitals or subdivisions of hospitals. The rank or score would have no absolute value but merely a relative value within the groups appraised. Direct comparisons are unavoidable when we operate without a scale or yardstick. However, this only makes explicit the fact that comparison lies at the basis of all meas-

urement. Measurement has been defined as "the assignment of numerals to things so as to represent facts and conventions about them . . . under a consistent set of rules" (54).

The operations to which any measurements can be subjected depend on the rules that can be made and on the validity and reliability of the values obtained. However, with any measurements we make comparisons. If we measure height, we compare the height of the subject with the markings on an arbitrary scale. These markings have meaning only in terms of established norms, of earlier results on the same subject, or of readings obtained from another subject. When we don't have a ruler, we can stand two subjects next to each other and make the comparison directly. Similarly, any index of quality may be measured against a yardstick, or the values obtained on several hospitals may be directly compared.

### The Basis of Comparison

Any of the four approaches to quality, therefore, involve comparisons, either indirectly through the use of standards or directly. In program evaluations the basis of comparison is vital. If a specific procedure has an effect on quality, it must be revealed in differences. To find such differences, the hospital under study must be compared with something, either with other hospitals or with itself before inception of the program. When differences exist, it is of paramount importance to isolate differences related to the program itself from differences owing to such other factors as changes in time, economic differences, cultural differences, and so on. The selection of a basis of comparison or control is crucial in this attempt.

The basis of comparison and the indexes to be used, in fact the plan for evaluation of a new procedure or program, should go hand in hand with planning the program itself. Ideally, before the new procedure is instituted, several similar hospitals would be chosen. By random selection, half would become experimental units for the new program, and half, controls (55). A careful study of patient care would be made in all the hospitals before instituting the new program and again at a suitable

time after the program was in effect. Medical and social progress occurring during this period might produce changes in both experimental and control units. But the changes might be different, and it is these changes that would be compared.

Such an experiment would be relatively simple if it tested only one procedure at a time. Thus one could, for example, estimate the effect of providing small hospitals with special courses for laboratory technicians by comparing changes in the accuracy of their results in certain procedures. More complex programs should also be amenable to this type of experiment.

However, there are cases where this does not apply. The effects of an existing program are to be evaluated, or a hospital plans to embark on a new program, and a study is to be made of quality before and after. The institutions then are self-selected and thereby are different from other hospitals. The before-and-after case does not make the problem simpler. A comparison within the one hospital at two different periods necessitates control of secular changes related to the passage of time or changes owing to extraneous factors that may have come into play.

This situation has parallels in population studies, in public health research, and in clinical research. Analytical studies of what exists, rather than of a planned experiment, call for a more critical evaluation of the findings, and the conclusions must be more tentative. This is even truer when the analyses are retrospective, being made after the fact (56-59). However, in some cases it may be possible to select suitable controls for comparison (60) and to test their suitability by an examination of variables that might affect the result. The careful selection and critical analysis of the controls (61) are basic to the validity of the findings.

An important step in program evaluation, therefore, is the search for suitable controls and for methods of eliminating some of the many variables that affect the quality of care. This is especially difficult because hospitals are highly complex institutions, and patient care is an intangible quality, influenced by many variables.

It is therefore possible that no comparable

units could be found for nonexperimental situations. In the event of failure to establish acceptable controls, or even as a complement to comparisons made with controls, there is another avenue of approach that might prove fruitful. One might formulate a hypothesis such as:

"Characteristic  $\alpha$  is usually found only in teaching hospitals. A random sample of non-teaching hospitals in comparable communities will show low values for  $\alpha$ , but an examination of hospitals in our group will reveal significantly higher values."

Characteristic  $\alpha$  might be laboratory services of a certain type, or rehabilitation services, or one of the quantitative indexes considered. Such an approach, of course, adopts the rest of the country as controls. As in other situations, purely descriptive studies may be used as a basis for planning future experiments.

Many references have already been made to testing the validity of various indexes. This could be done in various ways. One would be through a statistically controlled clinical analysis of each index. Another would be through seeking correlations among various measurements (37, 62) including qualitative appraisals. Thus, correlations might be sought among two or more measurements which are believed to measure practically the same thing. It might be found that a relatively simple, inexpensive objective test showed a high correlation with the results of the qualitative judgments, or, more likely, that a combination of such tests did so. Once the validity and applicability of such indicators were established, there would be many instances where they could be used instead of more difficult, expensive, and cumbersome techniques.

## Conclusions

Most of the work done to date in the appraisal of hospital quality has been related to the purposes of correcting abuses, setting minimum standards, and stimulating improvements in quality. The field of program evaluation is just beginning to be explored.

Techniques used in quality evaluations vary with the purposes of the particular study. The quality of care can be evaluated through a

multidimensional approach which results in a profile of the hospital. The main basis of the appraisal can be the use of one or a combination of: examinations for prerequisites for good care, indexes intended to measure elements of performance, indexes intended to measure the effect of care by results obtained, and qualitative clinical judgments.

Any indexes and standards used in such appraisals would be clearly defined, based on comparable data, and examined for their reliability and validity. Qualitative clinical appraisals should also be tested in a similar fashion and statistical controls and analysis applied to them as well.

Correlations among different indexes and judgments used should be attempted.

Appraisals which are intended to examine the effects of specific procedures or programs should be planned before the inception of the program.

The selection of an appropriate basis of comparison is crucial to program evaluation.

The development of practical and valid methods of measurement will involve the expenditure of considerable money and time. However, in view of efforts and money now being spent on programs to raise quality, it would seem essential to direct some of those resources toward the development of appropriate methods with which to judge their effects. Collaboration of clinicians, administrators, and statisticians is necessary for such a development.

A critical analysis of the particular methods used should be an explicit objective of a quality evaluation.

## REFERENCES

- (1) Reed, L. S., and Clark, D. A.: Appraising public medical services. *Am. J. Pub. Health* 31: 421-430, May 1941.
- (2) Goldmann, F.: The adequacy of medical care. *Yale J. Biol. & Med.* 19: 681-688, March 1947.
- (3) The quality of medical care in a national health program. A statement of the Subcommittee on Medical Care, American Public Health Association. *Am. J. Pub. Health* 39: 898-924, July 1949.
- (4) American Public Health Association. Subcommittee on Medical Care: The quality of medical care: Concepts, standards, methods of evaluation and improvement. Bibliography No. 9. New York, The Association, 1954. Processed.



- (5) Weinerman, E. R.: Appraisal of medical care programs. *Am. J. Pub. Health* 40: 1129-1134, September 1950.
- (6) Improving the quality of medical care. Dublin, T. D.: The training of personnel; Clark, D. A.: Group medical practice; Kaiser, A. D.: Regionalization of hospitals; Daily, E. F.: Sound principles of administration. *Am. J. Pub. Health* 39: 314-339, March 1949.
- (7) Lee, R. I., and Jones, L. W.: The fundamentals of good medical care. Chicago, University of Chicago Press, 1933.
- (8) Evaluation and health practice. Editorial. *Am. J. Pub. Health* 40: 868-869, July 1950.
- (9) Youmans, J. B.: Experience with a postgraduate course for practitioners: Evaluation of results. *J. A. Am. M. Coll.* 10: 154-173, May 1935.
- (10) Stouman, K., and Falk, I. S.: Health indices. A study of objective indices of health in relation to environment and sanitation. *Quart. Bull. Health Organ., League of Nations* 5: 901-1081, December 1936.
- (11) Methods in public health research. Proceedings of a conference held under the auspices of the Public Health Study Section, National Institutes of Health, in conjunction with the Graduate School of Public Health, University of Pittsburgh. *Am. J. Pub. Health* 41: 1-117, August 1951, pt. 2.
- (12) Evaluation studies which have contributed to school health services and education. *Am. J. Pub. Health (Year Book 1951-52)* 42: 125-129, May 1952, pt. 2.
- (13) Yankauer, A.: Designs for evaluation needed in the school health field. *Am. J. Pub. Health* 42: 655-660, June 1952.
- (14) American Public Health Association. Medical Care and Statistics Sections. Joint Committee on Medical Care Statistics: Medical care statistics. New York, The Association, 1953. Processed.
- (15) Sheps, M. C., and Sheps, C. G.: Assessing the effectiveness of programs in operation. Study group reports, Committee IV on research, National Conference on Care of the Long-Term Patient. Baltimore, Commission on Chronic Illness, 1954, pp. 93-104. Processed.
- (16) Cowles, J. T.: Current trends in examination procedures. *J. A. M. A.* 155: 1383-1387, August 14, 1954.
- (17) Commission on Hospital Care: Hospital care in the United States. New York, the Commonwealth Fund, 1947.
- (18) Gonzalez, J.: Medical staff organization vital to accreditation. *Hospitals* 27: 104-106, April 1953.
- (19) Crosby, E. L.: The goal of accreditation. *Mod. Hosp.* 78: 74, May 1952.
- (20) Gundersen, G.: Benefits of hospital accreditation to the medical profession. *J. A. M. A.* 154: 917-918, March 13, 1954.
- (21) Ponton, T. R.: The medical staff in the hospital. Revised by M. T. MacEachern. Chicago, Physicians Record Co., 1953.
- (22) Hill, F. T.: The staff audit and the consultation ratio. *J. Maine M. A.* 42: 58-60, February 1951.
- (23) Mortrud, L. C.: The control of professional practice through the medical audit. *Hospitals* 27: 91, September 1953.
- (24) Krause, C. D.: The merits of a medical audit. *Mod. Hosp.* 81: 85-86, December 1953.
- (25) Perdew, W. C.: Are your patients properly cared for. A medical audit, or analysis, helps the staff answer this question. *Mod. Hosp.* 71: 84-88, July 1948.
- (26) Cabot, R. C.: Diagnostic pitfalls identified during a study of three thousand autopsies. *J. A. M. A.* 59: 2295-2298, December 28, 1912.
- (27) Swartout, H. O.: Ante-mortem and post-mortem diagnoses. *New England J. Med.* 211: 539-542, September 20, 1934.
- (28) Pohlen, K., and Emerson, H.: Errors in clinical statements of causes of death. *Am. J. Pub. Health* 42: 251-260, March 1942; 33: 505-516, May 1943.
- (29) Redlich, F. C., Dunsmore, R. H., Brody, E. B.: Delays and errors in the diagnosis of brain tumor. *New England J. Med.* 239: 945-950, December 16, 1948.
- (30) Miller, N. F.: Hysterectomy: Therapeutic necessity or surgical racket. *Am. J. Obst. & Gynec.* 51: 804-810, June 1946.
- (31) Doyle, J. C.: Unnecessary ovariectomies: Study based on removal of 704 normal ovaries from 546 patients. *J. A. M. A.* 148: 1105-1111, March 29, 1952.
- (32) Doyle, J. C.: Unnecessary hysterectomies: Study based on 6,248 operations in 35 hospitals during 1948. *J. A. M. A.* 151: 360-366, January 31, 1953.
- (33) Myers, R. S.: Professional activity study. Hospital statistics don't tell the truth. *Mod. Hosp.* 83: 53-54, July 1954.
- (34) Letourneau, C. U.: The legal and moral aspects of unnecessary surgery. *Hospitals* 27: 82-86, May 1953.
- (35) Robson, S. M.: Why pick on the surgeons? *Mod. Hosp.* 82: 57-58, February 1954.
- (36) Professional activity study. Slee, V. N.: Statistics influence medical practice; Mooi, H. R.: Doctors do take records seriously; Hoffmann, R. G.: We must ask the right questions to get the right answers; Erickson, W.: Small hospitals benefit by the new approach; Van der Kolk, B.: Did they have pneumonia—Or didn't they; Farr, V.: Record librarian lists advantages; Eisele, C. W.: Opinions are no basis for objective analysis. *Mod. Hosp.* 83: 53-64, July 1954.
- (37) Ciocco, A., Hunt, G. H., and Altman, I.: Statistics on clinical services to new patients in medi-

- cal groups. - Pub. Health Rep. 65: 99-115, January 27, 1950.
- (38) Furstenberg, F. F., Taback, M., Goldberg, H., and Davis, J. W.: Prescribing, an index to the quality of medical care: A study of the Baltimore City medical care program. *Am. J. Pub. Health* 43: 1299-1309, October 1953.
- (39) Leinbecke, P. A.: Measuring the quality of medical care through vital statistics based on hospital service areas. I. Comparative study of appendectomy rates. *Am. J. Pub. Health* 42: 276-286, March 1952.
- (40) Wright, M. J.: Improvement of patient care. A study at Harper Hospital. New York, G. P. Putnam's Sons, 1954.
- (41) O'Malley, M., and Kossack, C. F.: A statistical study of factors influencing the quality of patient care in hospitals. *Am. J. Pub. Health* 40: 1428-1443, November 1950.
- (42) Kossack, C. F.: To measure the quality of a hospital. *Mod. Hosp.* 81: 77-79, July 1953.
- (43) Hagood, M. J., and Price, D. O.: Statistics for sociologists. Rev. ed. New York, Henry Holt and Co., 1952, pp. 138-143.
- (44) Reynolds, W. E.: Some problems of clinical measurement in the study of chronic diseases. *In* Research in public health. Papers presented at the 1951 annual conference of the Milbank Memorial Fund. New York, Milbank Memorial Fund, 1952, pp. 76-88.
- (45) Meyer, S. N., Hougren, A., and Edwards, P.: Experimental error in the determination of tuberculin sensitivity. *Pub. Health Rep.* 66: 561-569, May 4, 1951.
- (46) Birkelo, C. C., Chamberlain, W. E., Phelps, P. S., Schools, P. E., Zacks, D., and Yerushalmy, J.: Tuberculosis case finding. A comparison of the effectiveness of various roentgenographic and photofluorographic methods. *J. A. M. A.* 133: 359-366, February 8, 1947.
- (47) Makover, H. B.: The quality of medical care: Methodology of survey of the medical groups associated with the Health Insurance Plan of New York. *Am. J. Pub. Health* 41: 824-832, July 1951.
- (48) Goldmann, F., and Graham, E. A.: The quality of medical care provided at the Labor Health Institute. St. Louis, Labor Health Institute, 1954.
- (49) Savage, I. R.: Bibliography of nonparametric statistics and related topics. *J. Am. Stat. A.* 48: 844-906, December 1953.
- (50) Bradley, R. A.: Some statistical methods in taste testing and quality evaluation. *Biometrics* 9: 22-38, March 1953.
- (51) Mason, D. D., and Koch, E. J.: Some problems in the design and statistical analysis of taste tests. *Biometrics* 9: 39-46, March 1953.
- (52) Moroney, M. J.: Facts from figures. Baltimore, Penguin Books, 1951, ch. 18.
- (53) Bradley, R. A.: Some notes on the theory and application of rank order statistics. Blacksburg, Virginia Agricultural Experiment Station of the Virginia Polytechnic Institute, undated. Processed.
- (54) Stevens, S. S.: On the theory of scales of measurement. *Science* 103: 677-680, June 7, 1946.
- (55) Greenberg, B. G., Harris, M. E., MacKinnon, C. F., and Chipman, S. S.: A method for evaluating the effectiveness of health education literature. *Am. J. Pub. Health* 43: 1147-1155, May 1953.
- (56) Hill, B. A.: Observation and experiment. *New England J. Med.* 248: 995-1001, June 11, 1953.
- (57) Dorn, H. F.: Philosophy of inferences from retrospective studies. *Am. J. Pub. Health* 43: 677-683, June 1953.
- (58) Cochran, W. G.: Matching in analytical studies. *Am. J. Pub. Health* 43: 684-691, June 1953.
- (59) Greenberg, B. G.: The use of analysis of covariance and balancing in analytical surveys. *Am. J. Pub. Health* 43: 692-699, June 1953.
- (60) Wright, J. J., Sheps, C. G., and Gifford, A. E.: Reports of the North Carolina syphilis studies. IV. Some problems in the evaluation of venereal disease education. *J. Ven. Dis. Inform.* 31: 125-133, May 1950.
- (61) Densen, P. M., Padget, P., Webster, B., Nicol, C. S., and Rich, C.: Studies in cardiovascular syphilis. II. Methodologic problems in the evaluation of therapy. *Am. J. Syph., Gonorr. & Ven. Dis.* 36: 64-76, January 1952.
- (62) Platt, P. S.: The validity of the appraisal form as a measure of administrative health practice. New York, American Public Health Association, 1928.







*Sert's mural showing man's conquest of disease.*

## WHO, the Catalyst in International Health

By HENRY van ZILE HYDE, M.D.

WE ARE MEETING here for the next 2 or 3 weeks in a room which is one of the great rooms of the world—the Council Room of the Palais des Nations—a room in which history has been and will progressively be made.

All of us are inspired and uplifted, as we carry on the business before us, in studying

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*Dr. Hyde, chief of the Division of International Health, Public Health Service, served as chairman of the Executive Board of the World Health Organization from May 1954 until May 1955. He was first appointed by the President as United States expert on the board in 1948 and reappointed in 1953. Dr. Hyde delivered this address at the board's 15th session in the Palais des Nations, Geneva, Switzerland, January 18, 1955.*

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the murals by the great Spanish artist, Sert, which surround us. They are to me, as I study them, a record of man's emergence from the primitive. One of our opportunities and privileges is to carry that emergence further along.

We are all aware of the technological ascent represented in the small panel on the right. The rapidity of this ascent indeed underlies many of the problems of our times.

The panel in front of us typifies war and the horrors of war and the triumph of war and the complete distress of war. And here also is man's emergence from bondage. Directly above us is represented man's intellectual progress and the use of reason in cementing nations together in peace.

Over here, on the other side, we see man climbing up in the field of health—our field—man emerging to better things in health and so-

cial well-being. It is particularly important to us to recognize that this panel, which represents disease and man's conquest of disease, is included as part of the whole which symbolizes man's progress toward peace.

Man cannot make progress, cannot emerge to the fullness of his development, carrying a great burden of disease. We have the opportunity to do something about it—that is what we are here for. It is a very unusual opportunity. There are very few men in our profession who have the opportunity to serve on the Executive Board of the World Health Organization—just a handful through a generation of public health progress.

As we enter our deliberations, we should do so with proper solemnity and thoughtfulness. It is proper that we keep in mind, in the light of the Sert panel symbolizing man's freedom from disease, the central significance of health in our work. It is in the title of our organization. It is included in the WHO constitution as our central objective. I think we can recognize that health is a good thing in itself—that there does not need to be any other excuse for health than health itself and what it does in giving scope and range to the mind and the spirit of man.

### The Setting for 1955

We are fortunate that in directing our efforts at health we are obtaining certain secondary effects, as byproducts, in economic and social advancement that are essential to total progress toward peaceful and decent living. We all know that we cannot have security in the world—we cannot have peace—without sufficient food for all people, adequate shelter, health, and I think particularly, an ever-widening horizon of opportunity. Man's emergence in technology, intellect, and spirit, which is so dramatically pictured in this room, must continue to provide the ever-widening horizon of opportunity.

Man's emergence is a relatively short story. It was only some 20,000 years ago that he stepped forth from his primeval state and began using tools. Progressively he freed himself from the all-encompassing hunt for food,

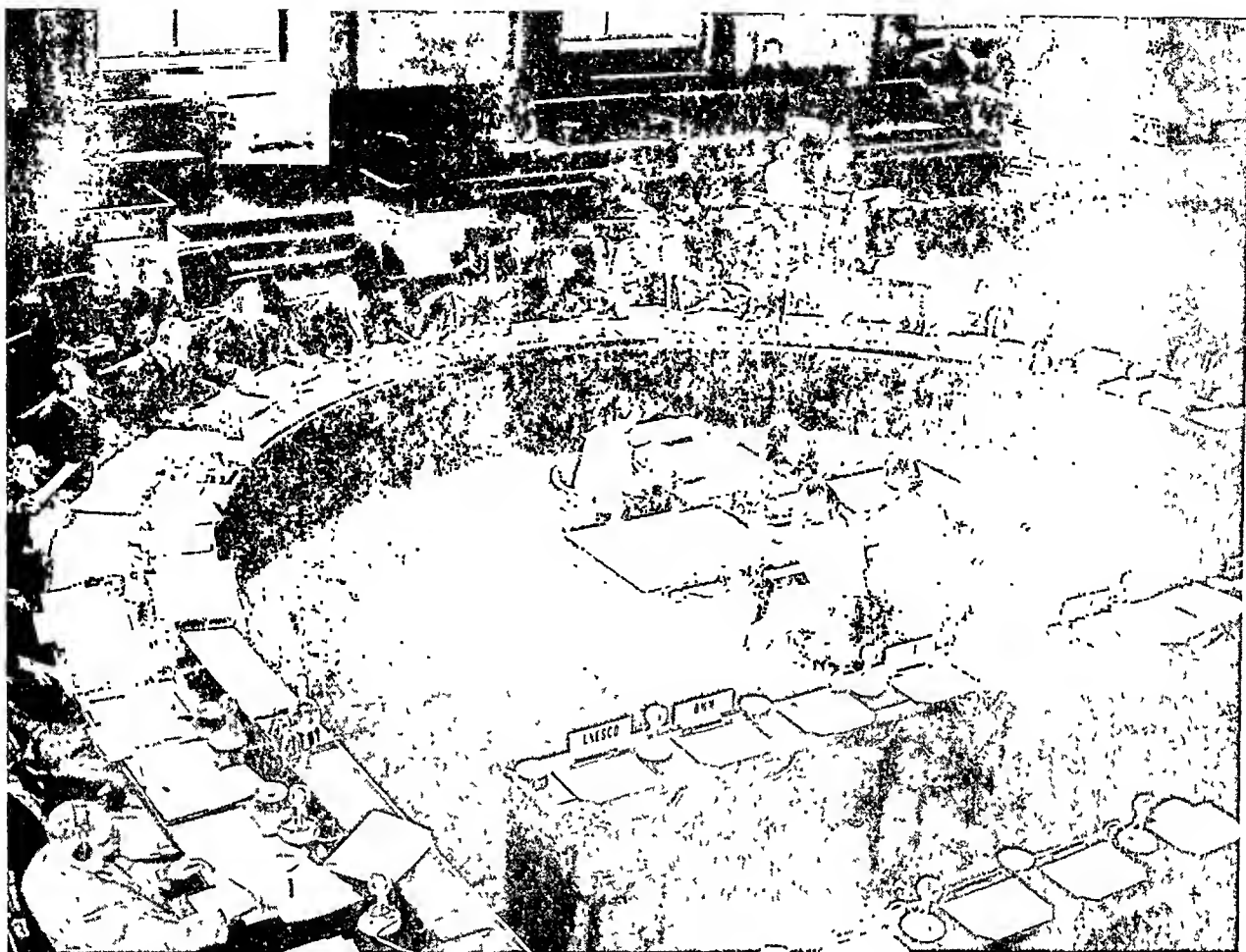
through the development of planting and the domestication of animals.

The period of his great technological development is a span of only some 4,000 years. It is the familiar story that begins in the Indus Valley, China, Mesopotamia, the Nile, and the Mediterranean. Through the period of technological emergence, there was constant groping for something deeper and more significant. In the millennium marked in midpoint by the beginning of the Christian era occurred the great flowering of the intellect and the spirit. This remarkable millenium included the classical period of Greece with its philosophers and the great moral and spiritual leaders of mankind—the Hebrew prophets, Zoroaster, Confucius, Lao-tse, Buddha, Christ, and Mohammed. It was the period of emergence of spirit and thought.

On the slate of history man seemed to go backwards for awhile, but a resurgence of cultural and intellectual development took place here in Europe in the 14th and 15th centuries. Later came the remarkable intellectual thirst of the 17th century which we see continuing today in the development of new concepts of the universe. That is indeed directly related to the work of this session of the Executive Board. The work of Newton and Galileo led to Einstein and to our present agenda, which includes an item dealing with atomic energy. This new source of power, instead of being a further step in man's emergence, can, if mishandled by you and me and by our generation, be the instrument of man's destruction—his final emergence to his own end.

This is the setting in which we find ourselves dealing in 1955 with the problem of health among men. It is appropriate that as we do so we pause to take a brief look at where our organization stands.

The history of the World Health Organization is an exceedingly brief one. We can find great cause for satisfaction in this history. In 9 years those of us who have had occasion to watch WHO have seen it grow from nothing to real greatness. It has attained stature as one of the great forces among men for good. It has become, on the world scene, a symbol for all that is best in international life: sympathetic under-



**The Executive Board of the World Health Organization, January 1955.**

standing among men; faith in the worthwhileness of the individual; helplessness, one to the other, without regard to false criteria; and man's full development of body, mind, and spirit.

Probably all of you who have studied the proposed annual WHO program and budget for 1956 (Official Records of the World Health Organization No. 58) have been impressed by the breadth of the work of this Organization, by how it has reached into the remotest corners of the world to places whose names even are new to you and me, despite the fact that we have traveled widely. As one reads the document, one obtains a sense of the reality of the fact that our colleagues, under the leadership of this body and our Director-General, are in myriads of places carrying on the very human work of the world.

Our regional directors, who are with us during this meeting, are closer to these problems than any of us, and they and their personnel are reaching the masses of the people. As a result the World Health Organization is better known to the millions of people in the less privileged areas of the world than any other international agency except perhaps FAO (Food and Agriculture Organization) and our fellow agency UNICEF (United Nations Children's Fund). I am sure that WHO is known and treasured in the hearts of persons to whom the political bodies of the United Nations are remote and incomprehensible unrealities, if indeed they are known at all.

It is encouraging that at the other end of the scale, in the cold and highly critical areas of science, the reputation of the Organization also stands secure. The world's greatest experts in

the medical sciences serve the World Health Organization with pride and readiness on its expert panels and expert committees. There was a recent example of the effect of the reputation of WHO in scientific circles, when, within a matter of a few days, the Director-General was able to bring to Geneva from great distances leading experts and authorities on the medical and biological aspects of atomic energy. There was no question about what WHO was, or where it stood, or what its reputation was. These men responded to the call of WHO immediately. I have seen some of our WHO monographs referred to by critics in responsible journals as classics in their field. In 9 years, to have produced classics in fields of health which are thousands of years old is a great accomplishment and is further testimony to the quality of the scientific work of the Organization.

I might say that in the field of administration also, WHO need bow to no other organization on the international scene. It provides a splendid demonstration of competent public administration in the highly complex environment characteristic of international life. I have had the privilege of working with your Standing Committee on Administration and Finance, and once again I have been tremendously impressed by the quality of the work done in budget planning and preparation and in the fiscal, financial, and administrative management of our organization. I am sure that when you review the reports coming forward from the standing committee, you will share my admiration.

Where the World Health Organization stands now, in these various respects, is indeed a vindication of the concept of the specialized agency within the United Nations framework. WHO is a triumphant example of the wisdom of the men in San Francisco who provided for this type of technical organization within the broad framework of the great political structure they created.

### **International Leadership**

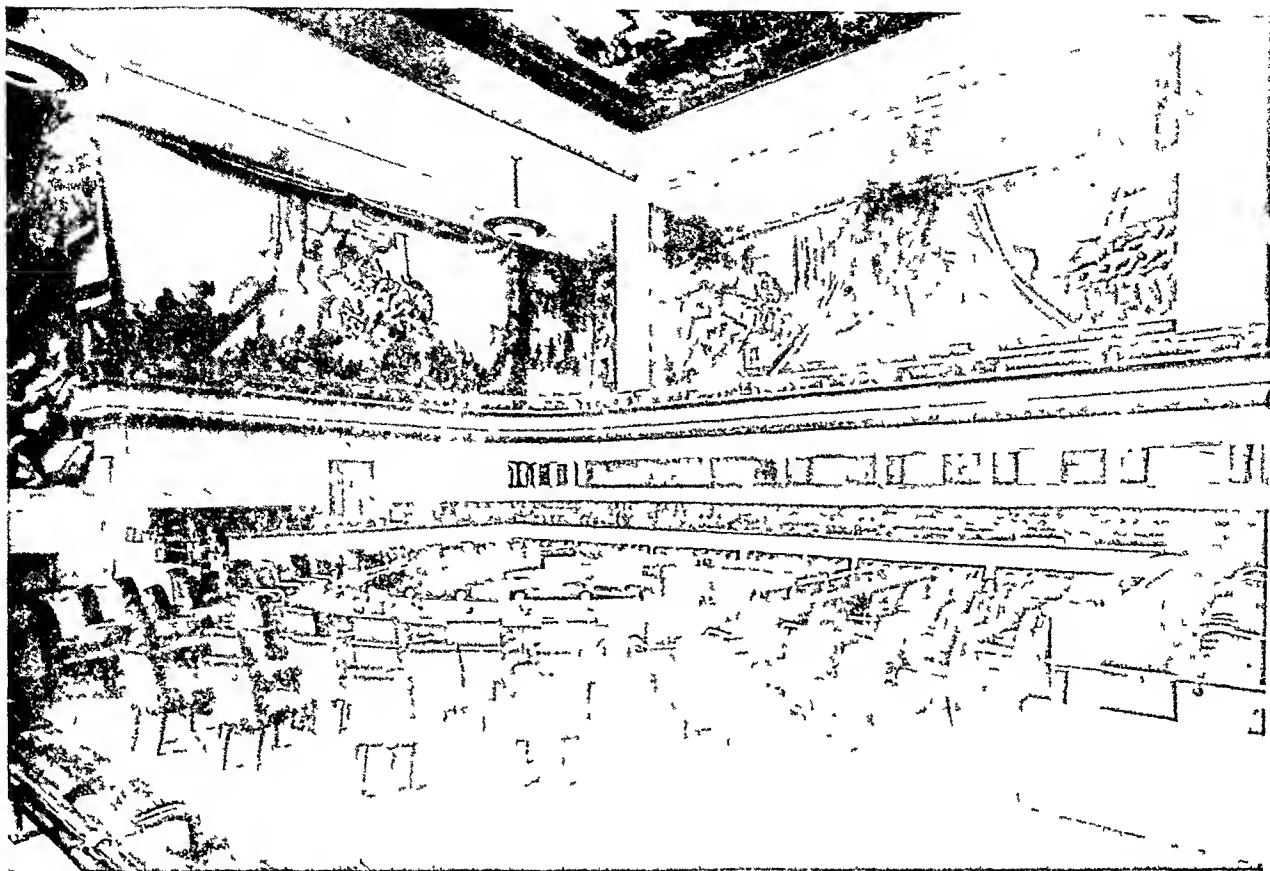
Now, I would like to say something for a moment about WHO and what its proper place is, as I see it, in the public health scene of the world. It is the leader, the stimulator, the catalyst in public health. The object of a local

health department is to mobilize and guide the total resources of the community toward the improvement of health. The local health department stimulates the department of education, the department of public works, the many voluntary agencies in the community, the associations, the clubs—all resources in the community—focusing them on the solution of the health problems of that community.

The World Health Organization, the directing and coordinating authority in international health work, as defined in its constitution, serves in this same stimulating leadership role on the world scene. It gives direction and leadership to the development of world health, and in so doing mobilizes all the available resources whether they are within the organization or are within the other specialized agencies, within the United Nations itself, within the voluntary agencies, or within the regional or national agencies devoted to social and economic development.

The annual report of the Director-General every year lists an amazing number of significant conferences in which WHO participates. Through such activity WHO influences many organizations to carry on health work and devote their resources to the solution of health problems which are pertinent to our organization and so stimulates great activity which otherwise would not take place. Further, you are all familiar with the technical conferences organized by WHO, the interregional and regional conferences that it has held on problems such as malaria and yaws, bringing all resources within large areas of the world to bear upon specific health problems.

It is heartening to see also the role that the World Health Organization is playing in regard to some of the bilateral programs of cooperation. It is my privilege to be familiar with the bilateral program of the United States of America, which, as many of you know, is a technical assistance program carried out in cooperation with a number of governments, and which has the same health objectives as the World Health Organization. The relationship between WHO and this program has avoided the pitfalls of possible conflict or duplication to become a truly intimate association with close integration of programs. This has



**The Council Room of the Palais des Nations, Geneva, Switzerland.**

greatly enhanced the value of both programs but particularly has contributed effectively and continuously to the total development of health in the countries where these programs are assisting in the development of national health activities.

I might cite just an example of how the World Health Organization is exerting its leadership. Many of you will remember that 2 years ago, here in Geneva, the leaders of WHO and of the bilateral program of the United States of America—the Technical Cooperation Administration as it then was—met together in a joint session and discussed objectives. That meeting had a tremendous influence on the course that has been taken by that program. Last year, a similar meeting was held in Panama, covering the Latin America area. At the moment, plans are going forward for a joint meeting of the WHO leadership and the chiefs of the United States bilateral health staffs in some 18 countries in

Africa and Asia. The meeting will be held in New Delhi and will consider common problems and common goals of the two programs.

In such ways as this, WHO is giving of its great knowledge and exerting leadership in all health programs that are being carried on at the international level. In no other place is there the concentration of knowledge concerning world health problems that there is in WHO.

#### **A Balanced Health Program**

We have already said something about the relationship of disease and health to the economy. Dr. C.-E. A. Winslow in his WHO monograph, *The Cost of Sickness and the Price of Health* (WHO Monograph Series, No. 7), presented this relationship with great clarity in a document which is among the classics produced by this Organization.

We must move forward in this field and give

our strength and our assistance to the programs of the United Nations in technical assistance for economic development. It is appropriate that when the United Nations has a program directed at economic development and recognizes the need for doing something about health as absolutely basic to that development, we should play an active role and give of our strength and our friendship to that program—not as a supplemental program in health but as an economic program of which health is an integral part.

We all know of the interest that people and their governments have in children: that they have opened their hearts and purses at this time in history to give special help. We, of course, have a keen interest in children, and we have the opportunity of doing special work for children in connection with UNICEF.

Interagency relationships are always complex: They are never entirely smooth. Certainly at the national level we have problems, all of us around the table, with other agencies within our own governments. And, I am sure, they have their problems with us. It is not strange that at the world level, which is even more complex, there should be occasional ripples on the surface. All we need do is to keep our high and total objective always before us—to remind ourselves of our ultimate goal, which is the progress of health.

I believe that we can handle these relationships with no real difficulty if we keep our sights sufficiently high. We must, of course, keep a balanced public health program. We are the agency responsible for total public health progress, and the Seventh World Health Assembly (1954) in its resolution on UNICEF

particularly pointed out the need for us to keep that balance. We must be sure that we do not deflect our central resources too far away from our central objective in giving assistance to other organizations. That is a matter of judgment and wisdom which this board is expected to exercise.

During this session we shall be dealing with these matters, and it will be a great opportunity for us, as individuals. We shall be getting better acquainted. I wish to welcome the new members who are among us. I am sure that in a few days we shall all be good personal friends and, at the end of our deliberations, very warm, firm, and permanent friends. That has been the experience of the board, and that is the spirit in which we do our business. Also, we shall have a chance to become acquainted with our great Director-General, with members of his staff, and, when we are particularly fortunate, with their families.

At this point I wish to pay a special tribute, if I may, to the WHO officials and their families. They have in my view the greatness of spirit that allows separations and personal sacrifices and even encounters with danger in the work that means so much to all men in the world.

So I might close by pointing out that the World Health Organization is a team of dedicated people and by expressing the hope that our visit here—yours and mine—may help to strengthen the Organization in its great work. We can be sure, as we settle down to the work in hand, that few undertakings can provide fuller opportunities than does WHO for the peaceful advancement of mankind.



*A practicing pediatrician speaks on how physicians can help educate their patients in accident prevention.*

## Accidents and Poisonings in Children

By JULIAN P. PRICE, M.D.

ACCIDENTS and accidental poisonings are the leading cause of death in this country in children over 1 year of age. This is a condition that we physicians find difficult to accept, accustomed as we are to think of death in terms of disease. But accept it we must for the public expects leadership from the medical profession and from the family physician in matters of health, and any condition which causes 1 death out of every 3 in our children is certainly in the field of health.

Statistics are usually boring and quickly forgotten, so I will present only a few to show the problem which confronts us. It has been estimated that every year in the United States some 2,000,000 children are involved in accidents requiring medical attention. Of this number, 12,000 die—and 40,000 to 50,000 are permanently disabled or crippled. There is no way of determining the number of children who are accidentally poisoned, but we know that 1,250 under the age of 21 and 400 under the age of 5 die from this cause each year.

What can the medical profession do, and what can the individual physician do to reduce

the toll of accidents and poisonings? In attempting to answer this question I do not pose as an expert, but speak as a practicing pediatrician who has become keenly interested in the subject and who has evolved certain ideas from the writings of others and from his own personal experience.

### Fields for Action

There are three special fields in which we should exert our efforts. First, we need studies and investigations to give us more basic information. Research on accidents in adults has been conducted for some time, but only recently has study been made of accidents in children. What has been done has been encouraging and enlightening—such as the work of Press, Wheatley, Dietrich, Arena, Shaffer, Dennis and Kaiser, and others—but we need more.

One phase of the problem which needs particular attention is that of the accident-prone individual. Langford and his associates have made a preliminary report on the study of nine such children. No definite conclusions can be drawn from this small number, but some of the observations and ideas offered are most suggestive. It is to be hoped that the work will be continued and enlarged. It is extremely important that we be able to recognize and help the accident-prone child before rather than after he runs into trouble.

The physician needs help to handle acci-

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*Dr. Price is a practicing pediatrician in Florence, S. C., and pediatrician at the McLeod Infirmary in Florence. This address was given at the annual meeting of the American Academy of General Practice in Los Angeles, February 1955.*

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dents and poisonings more effectively. This is a second field of activity which needs developing. If a child cuts his leg, the accepted procedure is to clean the wound, suture it, and give tetanus toxoid or antitoxin. But when a child is extensively burned, the problem of what to do is not so simple. Should the burn be cleaned? If so, how? Should the child be given a general anesthetic? What type of dressing should be applied? Does the child need sedation, plasma, electrolyte or glucose solution, or blood? Upon the answer to these questions may depend the life of the child.

When a little boy drinks kerosene—one of the more popular drinks among children these days—a recognized method of treatment is to empty the stomach, give an antibiotic, and watch for signs of chemical irritation of the lung. But what of the little girl who eats rat poison? What is the toxic ingredient in this particular preparation? Is there an antidote? What are the complications to be watched for? An immediate answer to these questions will help materially.

Burns, fractures, penetrating wounds, lacerations, shock, intracranial hemorrhage, and ruptured viscera are some of the conditions which may be encountered in the accident patient. Roach powder, pesticides, medicines, floor polish, moth balls, cosmetics are but a few of the poisons which may be eaten by the little child.

To help the physician to be more effective in his care of victims of accidents and poisonings, I would suggest that more time be given to these conditions in the training of interns, in general meetings such as this, and in post-graduate courses for the general practitioner and for the pediatrician. Further, I would urge that every doctor's office and every emergency room in a hospital have available for quick reference not only a textbook on traumatic surgery but also 1 or 2 reference books which discuss the common household items which might be implicated in poisonings. Two such volumes which I have found valuable are *Symptoms and Treatment of Acute Poisoning* by G. H. W. Lucas, and *Handbook of Pediatric Medical Emergencies* by Desanctis and Varga.

A recent development which should prove of considerable value in the realm of accidental

poisonings is the establishment of poisoning control centers in our larger communities. The first such center is now in operation in Chicago, and others are being established in Boston, New York, and Cincinnati. These centers will treat poisonings, conduct special studies as to their cause, and promote their prevention. They will also serve as information centers to which the practicing physician can turn for help at any time.

The third field of activity to which we must bend our effort is that of education. The only way in which we can hope to reduce the number of accidents and poisonings in children is through prevention, and prevention hinges on educating the public about the need and methods of forestalling accidents.

Many national organizations have engaged in educational efforts—the National Safety Council, the American Automobile Association, the American Red Cross, the National Board of Fire Underwriters, and the National Committee for Traffic Safety. Public health associations have carried on special campaigns. The American Academy of Pediatrics, through its Committee of Accident Prevention, has promoted State and local conferences. It has stimulated the formation of accident prevention committees, and, with the assistance of the Metropolitan Life Insurance Company, has prepared a number of educational pamphlets. The American Medical Association has long been concerned with accidental trauma and more recently has entered the field of poisonings through its Committees of Toxicology and Pesticides.

These organizations and others have done yeoman service, and they need our thanks for what they have accomplished and our support as they continue their work. But their efforts alone are not sufficient. They must be joined by that individual who, in my opinion, is the greatest single source of strength in our educational effort, the practicing physician. It is he who can most easily influence the two key individuals in our war against accidents and poisonings—the parent and the child.

It is my sincere hope that medical organizations will spearhead an educational effort in which the parents of America, along with their children, will be taught the fundamentals of



preventing accidents and poisonings. This education should be carried on where it will be most valuable—in the office of the physician and in the home of the child. And it should be carried on by the one whose word would be most heeded—the family physician.

### What Physicians Can Do

There are a number of ways in which the practicing physician can participate in such an educational effort. I would like to make six specific suggestions—suggestions culled from the experience of others and from my practice.

The physician must become safety-minded in the prescribing of drugs. Specific instructions should be given to the family and to the druggist. The mother should be told what the drug is for and how it is to be given. General instructions on the label should be avoided. "A spoonful as needed," may be understood the day it is prescribed, but a month later the parents may have forgotten the indications for its use as well as the size of the spoon, with regretful results.

The amount of a drug prescribed should be limited to a quantity sufficient for 2 or 3 days only. Recently I saw a prescription written for 6 ounces of a sulfa preparation for a child with a mild upper respiratory infection. I pictured what might happen. The child would probably be well by the time he had taken 2 or 3 ounces. The half filled bottle would then be put in the medicine chest or on the windowsill in the bathroom. There it would sit until it could be used for some subsequent illness in the family, or else it would be found by some adventure-some youngster and gleefully drunk.

I may or may not have been right in this particular instance, but I know that the medicine closets of many families in this country are cluttered with bottles half filled with medicine or boxes partially filled with tablets which are potential poisoners of children. To prescribe only what is needed for a specific illness and that only for a specific period of time is good medicine—it is also one of the first steps in preventing drug poisonings.

The physician should take time to discuss accidents and poisonings with parents when they bring their children to his office. This is of

particular importance when the child is between the ages of 1 and 4—the danger age. Mention should be made of the type of activity in which the child is likely to participate such as crawling, climbing, investigating with the fingers, and putting objects in the mouth. The parent should be shown how these activities can lead to trouble if ordinary precautions are not taken.

Attention should be called to the special care which should be taken near such items as stoves, floor furnaces, hot water, stepladders, and electrical outlets. The need for keeping such articles as liniments, medicines, fingernail polish, floor wax, and insecticides in a place where the child cannot get to them should be emphasized. The parents should be urged to make a survey of the yard and playground to see that hazards such as broken glass, wooden stakes, and sharp tools are not present.

The children themselves should be talked to about accidents and poisonings. Many a youngster will listen with more attention to his doctor than he will to his parents. They should be told of the need for staying out of the street, of the care which they must exercise when riding tricycles and bicycles, of the dangers of playing with matches and firecrackers. They should be warned against taking medicines of their own accord. Older children, particularly boys, should be told of the need for caution with regard to swimming and diving—never to go swimming alone and never to dive into unknown water.

Literature should be available in the physician's office for parents to read and to take home for study. Quantities of home and child safety materials are available from many of the major insurance companies. Pamphlets on specific phases of safety education can be obtained from the National Safety Council. An excellent checklist for parents has been prepared by the American Academy of Pediatrics. Published information of this type, or perhaps material especially prepared by the American Academy of General Practice, needs to be placed in every general practitioner's office. There is no telling how much of this would be read, but I have yet to see a parent who did not appreciate an article or pamphlet on safety when I presented it with the request that it be taken home and studied.

The physician should investigate the home and yard environment when making calls. Are the stairs safe for the youngsters? Are there proper safeguards around the stove and fireplace? Are cigarette lighters or matches lying within easy reach of the children? Are the window screens securely fastened? Is there a special place for medicines?

These are but a few of the questions which the physician with a keen eye and inquiring mind will ask himself as he goes in to see the sick child. From what he sees, the physician can give pertinent advice to the parents.

The physician must become a crusader in the cause of accident and poison prevention. He must convince himself that accidents and poisonings are the number one problem in child health today—and then convince others. In the office, in the home, at meetings of the PTA, in public gatherings, whenever and wherever the opportunity presents itself, he must discuss the problem and enlist the support of others.

Typhoid fever was not eradicated with the discovery of typhoid vaccine; it only disappeared as the public was made to understand the value of the vaccine and was willing to have it injected into them. In the same way, accidents and poisonings will not be diminished materially through programs and studies. They will only be reduced as those who are pri-

marily concerned—physicians, parents, and children—appreciate and understand the problem and put into practice those measures which are needed to bring about a change.

There is nothing unusual or dramatic in the suggestions presented—it is the accident and not its prevention which is sensational. I am convinced, however, that if every member of this great organization would put these suggestions into effect there would be a marked reduction in the number of accidents and poisonings in children.

In conclusion, I would like to stress the need for joint effort in our fight against the number one killer of our children. The task is too large for any single organization or for any group of individuals. It challenges the combined effort of all. Local, State, and national organizations now in the field must be encouraged to continue and to increase their efforts. Medical associations such as the American Academy of General Practice, the American Academy of Pediatrics, and the American Medical Association must be urged to further activity. Above all, the practicing physician who deals with parents and with children must be made aware of the problem and be stimulated to join his colleagues in an all-out campaign of education in this fight for the safety and welfare of our boys and girls.

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## Cardiovascular Training Center for Nurses

A pilot cardiovascular training center for nurses, the first of its kind, will commence operation January 1, 1956, at the University of Minnesota School of Public Health, according to present plans.

Cooperating in the project with the Public Health Service and the University of Minnesota are the Minnesota Department of Health and other agencies in Minneapolis and St. Paul which will offer trainees field experience in special services for cardiovascular patients.

The center expects to give nursing leaders a better understanding of new developments in the cardiovascular field and methods of applying them to the nursing care of patients, both in the home and hospital.

Applications for the training center are being received at the University of Minnesota School of Public Health, Minneapolis.

# Limitations of Water Treatment Methods for Removing Radioactive Contaminants

By CONRAD P. STRAUB, Ph.D.

RADIOACTIVITY has been known since 1896, when Becquerel first observed the phenomenon by its effect on photographic plate. However, until the first controlled nuclear chain reaction was demonstrated, the supply of radioactive materials was limited, and the opportunities for large groups of the population to be exposed to significant amounts of radiation were small. Since 1942, many kinds and considerable quantities of radioisotopes, many of high specific activity, have been produced in nuclear reactors.

Increased use of radioisotopes in recent years has resulted in the discharge of these materials to the environment. A 1954 report, based on a questionnaire sent out in December 1952 to 1,027 users of radioisotopes, showed that about 41 percent of them disposed of radioactive wastes by dilution and discharge to the sewers (1). In all probability, the amounts of radioactive materials used will increase many fold over the amounts employed now, as additional applications are developed. An increase in the amounts used will, in turn, result in the release

of a greater variety of radioisotopes, as well as greater quantities of radioactive materials. At present, considerable effort is being expended in developing nuclear energy as a source of power. These developments will aggravate the waste disposal problem and will add emphasis to the statement made in 1951 by Mark D. Hollis, chief engineer officer of the Public Health Service, that public health officials will be responsible for protecting the public against the harmful effects of ionizing radiations (2).

## Maximum Permissible Concentrations

Ionizing radiations, which result from the disintegration of unstable nuclei, are damaging to living tissues. The extent of damage from internal exposure to radiation depends on many factors, some of which are the quantity of radioactive material deposited in the body; the point of localization; the type of radiation (alpha, beta, or gamma); chemical state of the isotopes deposited in the body; energy of the radiation; and the physical and biological half-lives of the isotopes. These factors and others are considered in establishing the maximum permissible amounts of radioisotopes in the human body and the maximum permissible concentrations in air and water. Maximum permissible amounts in the body and maximum permissible concentrations in the environment are summarized and reported in a handbook published by the National Bureau of Standards (3).

The maximum permissible concentration

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*Dr. Straub, a sanitary engineer with the Robert A. Taft Sanitary Engineering Center, Public Health Service, is in charge of the Center's Oak Ridge Field Activity, Oak Ridge National Laboratory, Oak Ridge, Tenn. This paper was presented on December 1, 1954, at a meeting of the Association of Military Surgeons in Washington, D. C.*

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(MPC) values serve as a guide to the public health official in determining the levels of radioactive materials that may be discharged from various installations and the amounts of these materials that may be permitted in the air we breathe and the water we drink. They represent the best available information on permissible concentrations of radioactive materials in the environment. It should be noted that these values have been derived on the assumption that the contaminated supply is the sole source of supply during the lifetime of an individual (taken as 70 years). Further, it is assumed that these values are superimposed on the natural background radiation of the particular area under study.

### Comparison With Other Contaminants

The Drinking Water Standards promulgated by the Public Health Service define limits for specific materials in waters used for drinking on interstate carriers. In table 1 are shown some of these limits and the maximum permissible concentrations in water of similar radioisotopes. It can be seen that the concentrations permitted on the basis of radioactivity are many orders of magnitude lower than safe or ac-

ceptable concentrations of the stable isotopes of the same element. These extremely low concentrations present a problem of identification, since ordinary qualitative and quantitative procedures are of little value in detecting and identifying the presence of such minute concentrations of specific radioisotopes. However, because these materials are radioactive, it is possible to use this characteristic to detect, measure, and identify them. The radiochemical procedures used to identify specific radioisotopes, however, become less accurate as the number of different radioactive constituents present increases.

A characteristic of radioactivity that should be mentioned, in order fully to understand the difficulties in handling these materials and removing them from waters to make them safe for normal use, is that the rate of disintegration cannot be altered by any physical, chemical, or biological process. Other polluting substances can be removed or modified so that they are no longer noxious: For example, chromium or other heavy metals may be eliminated by precipitation; cyanides may be treated with chlorine to form the relatively nontoxic cyanate, which may decompose further to ammonium carbonate; or pathogenic bacteria may be de-

**Table 1. Quantitative comparison of limits set by Public Health Service Drinking Water Standards and maximum permissible concentrations of radioisotopes in water**

Chemical constituent	Drinking water standards		Maximum permissible concentration		Radioactive form
	p.p.m. (mg./l.)	µg./cc.	µg./cc.	µc./cc.	
<i>Grounds for rejection</i>					
Lead (Pb)-----	0. 1	$1 \times 10^{-1}$	-----	-----	-----
Fluoride (F)-----	1. 5	$1. 5 \times 10^0$	-----	-----	-----
Arsenic (As)-----	. 05	$5 \times 10^{-2}$	-----	-----	-----
Selenium (Se)-----	. 05	$5 \times 10^{-2}$	-----	-----	-----
Chromium (Cr <sup>+6</sup> )-----	. 05	$5 \times 10^{-2}$	$5. 2 \times 10^{-6}$	0. 5	Cr <sup>51</sup>
<i>Recommended values</i>					
Copper (Cu)-----	3. 0	$3 \times 10^0$	$2. 1 \times 10^{-8}$	$8 \times 10^{-2}$	Cu <sup>64</sup>
Iron and manganese (Fe + Mn)-----	. 3	$3 \times 10^{-1}$	$1. 8 \times 10^{-6}$	$4 \times 10^{-3}$	Fe <sup>55</sup>
			$2. 1 \times 10^{-9}$	$1 \times 10^{-4}$	Fe <sup>59</sup>
			$9. 3 \times 10^{-9}$	0. 2	Mn <sup>56</sup>
Magnesium (Mg)-----	125	$1. 25 \times 10^2$	-----	-----	-----
Zinc (Zn)-----	15	$1. 5 \times 10^1$	-----	-----	-----
Chloride (Cl)-----	250	$2. 5 \times 10^2$	$8. 9 \times 10^{-2}$	$2 \times 10^{-3}$	Cl <sup>36</sup>
Sulfate (SO <sub>4</sub> )-----	250	$0. 83 \times 10^2$	$1. 2 \times 10^{-7}$	$5 \times 10^{-3}$	S <sup>35</sup>
		(as sulfur)			
Phenolic compounds (C <sub>6</sub> H <sub>5</sub> OH) <sup>1</sup> -----	. 001	<sup>1</sup> $1. 5 \times 10^{-4}$	$6. 7 \times 10^{-4}$	$3 \times 10^{-3}$	C <sup>14</sup>

<sup>1</sup> Assuming that only one of the carbon atoms is radioactive carbon-14.

stroyed by disinfection, pasteurization, or sterilization. All that can be done with radioactive wastes is to transfer the radioactive component from one phase to another: The soluble materials, for example, may be removed by precipitation, adsorption, and the like. The radioactive fraction remains for disposal. Thus far, the only real solution, and it is a tentative one, is storage, and this is the method now used to dispose of high-level wastes. The less hazardous and low-level wastes may be discharged into surface waters or into the ground. When discharged into the ground, the wastes may come in contact with the ground water and move slowly with it, and some of the radioactive materials may be removed by adsorption on the soils through which the waste stream and ground water flow.

### Basic Principles

The efficiency of conventional water treatment processes for the removal of radioactive contaminants must be geared to the MPC values. Since these values define the accepted permissible levels of contamination, they may be used to calculate the degree of removal that must be provided to meet these levels when the nature and the amount of activity initially present are known. For example, if a water supply contains  $10\mu\text{c./ml.}$  of promethium-147 and the MPC value for this substance is  $1\mu\text{c./ml.}$ , treatment which will result in removal of 90 percent of the promethium must be provided. Or, if the efficiency of a particular process and the MPC value are given, the maximum concentration of that component in the waters used for public water supplies can be stipulated. For strontium-89, for example, with an MPC value of  $7 \times 10^{-5} \mu\text{c./ml.}$  and a process that results in 90 percent removal of this substance, the highest concentration that may be present in the waters to be treated is  $7 \times 10^{-4} \mu\text{c./ml.}$  The difference in the initial concentrations of promethium-147 and strontium-89 varies by a factor of approximately 14,000 and is due entirely to the difference in their MPC values.

Conventional water treatment processes include coagulation, settling, filtration, and disinfection. In addition, auxiliary treatment, such as aeration, softening, and iron and man-

**Table 2. Removal of radioisotopes by coagulation and settling: results obtained in jar-test studies**

Radioisotope	Clay added <sup>1</sup> (p.p.m.)	Coagulant added <sup>2</sup> (g.p.g.)	Final pH	Per- cent re- moval
Cesium-137—	0	1	-----	0-6
barium-137	100	1	-----	35-65
Strontium-89----	0	<sup>3</sup> 1.5	6.7-7.8	0-6
	100	0.5-6	6.7-10.7	0-51
Cadmium-115----	0	1	-----	40-60
	100	1-5	-----	60-95
Barium-140—	100	1-6	7.5-8.2	28-84
lanthanum-140.				
Scandium-46----	100	1-6	6.5-8.2	66-98
	0	<sup>3</sup> 1.5	6.8-7.1	83-93
Yttrium-91-----	100	1-6	7.0-10.2	34-99
Zirconium-95—	0	1-5	-----	70-98
niobium-95-----	100	1	-----	95-99
Phosphorus-32----	100 <sup>3</sup>	0.5-1.5	6.8-8.8	97-99
Chromium-51----	100	1-6	7.6-8.8	73-98
Tungsten-185----	100	1-6	7.5-8.4	5-91
Iodine-131-----	100 <sup>3</sup>	0.5-2	6.9-9.0	0-10
	0	<sup>3</sup> 1-1.5	7.2-7.8	81-94
Cerium-144-----	100 <sup>3</sup>	0.5-2.5	7.0-7.8	85-96
FPM-1 <sup>4</sup> -----	100	<sup>3</sup> 1-3	7.2-8.8	61-84
	0	1-5	4.3-10.2	9-71
FPM-2 <sup>5</sup> -----	100	1-5	4.3-10.2	12-73
FPM-3 <sup>6</sup> -----	0	10	9.9-10.0	46

<sup>1</sup> Local clay was added.

<sup>2</sup> Coagulant includes alum, ferrous sulfate, or ferric chloride; lime, soda ash, or sodium hydroxide; and sodium silicate.

<sup>3</sup> No sodium silicate added. Where added sodium silicate equals 40 percent primary coagulant dose.

<sup>4</sup> Iodine dissolver solution.

<sup>5</sup> Synthetic mixture containing fission products in the same concentrations assumed to be present 30 days after an underwater bomb blast.

<sup>6</sup> 3-year-old fission product mixture.

NOTE: In pairs of radioisotopes, the first is the parent element, and the second, the daughter. Both are radioactive.

ganese removal, may be used. Any discussion of treatment methods must take into account the fact that radioactive and stable isotopes of an element behave identically during chemical treatment. Thus, if the conventional process is not designed to remove a specific element, there is no reason to believe that the process will remove the specific radioisotope. Radioactive calcium, barium, or strontium, for example, will be significantly removed by softening, since the purpose of softening is to remove calcium. Barium and strontium will be removed with calcium, because of their similar chemical properties.

To show the limitations of conventional water treatment methods for the removal of radio-

**Table 3. Removal of radioisotopes by sand filtration: results obtained in laboratory tests**

Radioisotope	Initial activity (c./m./ml.)	Volume passed (ml.)	pH of effluent	Percent removal	
				Range	Average
Cesium-137—barium-137-----	800	500	8.3	10-70	50
Strontium-89-----	2,700	750	8.3	1-13	4
Cadmium-115-----	1,200	500	8.1	60-99	95
Barium-140—lanthanum-140-----	1,300	750	7.6	39-99	74
Scandium-46-----	1,500	750	8.3	94-99	96
Yttrium-91-----	5,700	750	7.0	84-89	87
Zirconium-95—niobium-95-----	3,400	500	7.8	91-96	93
Tungsten-185-----	2,200	750	7.1	3-18	8

NOTE: In pairs of radioisotopes, the first is the parent element, and the second, the daughter. Both are radioactive.

active materials, the results of experimental work at Oak Ridge National Laboratory, which has been carried out in cooperation with the Public Health Service and the Engineer Research and Development Laboratories at Fort Belvoir, Va., and of studies reported in the literature are cited.

### Coagulation

In coagulation, certain soluble constituents are precipitated as insoluble hydroxides or are carried along with the heavy metal hydroxides that are formed when alum or iron salts are used. With the exception of most cations of valence 3, 4, or 5, including the rare-earths group, coagulation has not been very effective for the removal of radioactive materials from water (4). Phosphorus-32 has been removed from waters contaminated with this radioisotope (4, 5), but considerable care had to be given to the coagulation step (5). Removals in excess of 98 percent have been reported. Iodine-131, which is in the form of an anion, cannot be removed by coagulation with alum or iron. However, the addition of small amounts of activated carbon (4), copper sulfate (4), or silver nitrate (4, 6) has been found to increase the removal of this anion to about 96 percent. Other data are reported in table 2.

Coagulation is also helpful in the removal

of radioactive material attached to or adsorbed on the natural turbidity found in many surface waters. Since coagulation will remove much of the turbidity, the activity attached to it will also be removed.

### Sand Filtration

Except for removal by simple straining or sorption by the biological life contained in the *Schmutzdecke* sand filters, as shown in table 3, have not been effective for the removal of radioactive materials (7-9). Their major function is to remove the radioactivity previously incorporated in floc particles.

### Softening

Softening with lime and soda ash has been studied (9-12) and, under proper conditions, effective removals of radioactive strontium, barium, cadmium, yttrium, scandium, and zirconium-niobium have been obtained (9). As shown in table 4, removals of 95 to 99 percent or better have been accomplished. For the most satisfactory removal of strontium, excesses of both lime and soda ash are required (10). Some recent studies have indicated that the strontium is removed by coprecipitation (10, 11) with the calcium carbonate by the mechanism of mixed crystal formation (11). Data on the removal of stable strontium from municipal water supplies (13) are given in table 5.

### Ion Exchange

Another method of softening that has been practiced for some time in municipal and industrial water treatment is ion exchange. Removal of radioactive materials by this process is technically possible (12, 14, 15). For most effective removal, mixed bed or cation and anion exchange beds in series are recommended. Results obtained with various types of synthetic exchange materials and with greensand (9), a material which has found considerable use in municipal softening installations, are shown in table 6. For adequate removals and economic operation, the waters to be treated should be low in dissolved solids. Experience in the laboratory has shown that certain radioactive mate-

**Table 4. Approximate minimum combined dosage <sup>1</sup> of lime and soda ash to give stated percentage removal of radioisotopes**

Radioisotope	50 percent removal		75 percent removal		90 percent removal		95 percent removal		99 percent removal	
	Lime (g.p.g.)	Soda (g.p.g.)	Lime (g.p.g.)	Soda (g.p.g.)	Lime (g.p.g.)	Soda (g.p.g.)	Lime (g.p.g.)	Soda (g.p.g.)	Lime (g.p.g.)	Soda (g.p.g.)
Barium-140—lanthanum-140	2	2	4	2	6	4	—	—	—	—
Strontium-89	4	3	5	5	7	9	20	20	—	—
Cadmium-115	2	2	3	3	4	4	4	4	6	4
Scandium-46	3	3	3	3	5	5	—	—	—	—
Yttrium-91	2	2	4	4	6	6	12	6	—	—
Zirconium-95—niobium-95	2	0	5	0	12	0	17	0	22	0
Cesium-137	48	48	—	—	—	—	—	—	—	—
Tungsten-185	48	48	—	—	—	—	—	—	—	—

<sup>1</sup> Minimum combined dosage is defined such that, of those variable dosages studied, the grains per gallon of lime plus the grains per gallon of soda ash is a minimum.

NOTE: In pairs of radioisotopes, the first is the parent element, and the second, the daughter. Both are radioactive.

rials will continue to be removed (about 50-percent removal) even though the column has been saturated with calcium and the hardness is no longer reduced.

### Modified Processes

Several modifications of existing water treatment processes have been studied in an effort to obtain better removals of specific radioactive materials. The most promising of these has been phosphate coagulation (16, 17), as indicated by the data in table 7. For many of the radioisotopes of interest, including strontium-89, relatively high percentage removals have been obtained, but for strontium-89 the

**Table 5. Removal of stable strontium by chemical treatment**

Type of treatment	Percent removal		Number of cities
	Average	Range	
Alum or ferrous sulfate	12	10-31	7
Alum or ferrous sulfate, plus lime	37	10-75	11
Alum or ferrous sulfate, plus lime and soda ash	54	10-85	3
Alum or ferrous sulfate, plus lime and phosphate	42	10-70	5
Softening only (phosphate, ion exchanger)	73	69-76	2
None (except chlorine, fluoride, carbon, or ammonia)	10	—	8

**Table 6. Percentage removal of individual radioisotopes with ion exchange materials**

Radioisotope	Cation exchange	Anion exchange	Mixed bed	Greensand
Tungsten-185	12 -16	97.2-99.2	98.9	9
Yttrium-91	86 -93.1	94.2-98.5	97.6 -98.7	75
Scandium-46	95.7-97.2	98.8-99.0	98.5 -98.7	96.4
Strontium-89	99.1-99.8	5 -7	99.95-99.97	99.8
Barium-140—lanthanum-140	98.3-99.0	36 -42	99.5 -99.6	96.3
Cesium-137	99.8	9	99.8	—
Cadmium-115	98.5	0	99.2	—
Zirconium-95—niobium-95	58 -75	96.4-99.9	90.9 -99.4	—

NOTE: In pairs of radioisotopes, the first is the parent element, and the second, the daughter. Both are radioactive.

**Table 7. Removal of radioisotopes by phosphate coagulation**

Radioisotope	Coagulant	Coagulant dose (mg./l.)	Percent removal
Cerium-144-----	{ $\text{KH}_2\text{PO}_4$	200	99.8
	{ $\text{Na}_3\text{PO}_4$	120	99.9
Strontium-89-----	{ $\text{KH}_2\text{PO}_4$	100	81.3
	{ $\text{Na}_3\text{PO}_4$	240	97.8
Yttrium-91-----	{ $\text{KH}_2\text{PO}_4$	100	99.9
	{ $\text{KH}_2\text{PO}_4$	100	66.1
Antimony-124-----	{ $\text{Na}_3\text{PO}_4$	120	67.4
	{ $\text{KH}_2\text{PO}_4$	50	99.6
Zinc-65-----	$\text{KH}_2\text{PO}_4$	200	10.7
Tungsten-185-----	$\text{KH}_2\text{PO}_4$	100	99.5
Zirconium-95-----	$\text{KH}_2\text{PO}_4$	100	99.2

results were obtained under carefully controlled conditions of pH and the calcium-hydroxide/trisodium-phosphate ratio. Other methods that have been suggested for the removal of radioactive materials from water include the use of metal powders (18) and added clay (4, 19). Results obtained with these materials are given in tables 8 and 9.

### Evaporation

Although not a municipal treatment method, evaporation is included in this discussion be-

cause it is the most effective process available at present for producing waters low in radioactivity. High decontamination factors are possible, but the cost is great. However, under emergency conditions, evaporation should prove to be very satisfactory.

### Removal of Mixed Fission Products

The discussion thus far has centered on the removal of specific radioisotopes from waste solutions. For a fission products mixture or any mixture of radioisotopes, the efficiency of removal is a function of the individual radioisotopes comprising the mixture. To date, removals of mixtures in the order of about 70 to 80 percent have been obtained with alum or iron coagulation (4). A series of studies on actual process waste waters at Oak Ridge National Laboratory disclosed that up to 90 percent of the contaminants could be removed with excess lime-soda ash softening or with phosphate coagulation when coupled with the addition of clay, which is specific for the removal of the cesium in the waste. Experimental results in removing fission products mixtures are summarized in table 10.

**Table 8. Removal of radioactive contaminants by metallic dusts**

[1,000 p.p.m. metal dust, 90 minute contact, filtered sample counted]

Contaminant	Stock solution pH	Initial activity (c./m./ml.)	Percent removal			
			Iron <sup>1</sup>	Zinc	Copper	Aluminum
Ruthenium-106—rhodium-106-----	8.0-8.2	1,975- 3,950	99.6	98.4	93.7	92.8
Yttrium-91-----	7.9-8.0	1,610- 3,230	98.0	98.0	-----	-----
Zirconium-95—niobium-95-----	7.2-8.3	1,210- 4,470	99.1	97.9	99.1	99.8
Phosphorus-32-----	7.8-8.4	128-12,000	99.8	98.1	-----	84.2
Iodine-131-----	6.5-8.2	4,288- 6,689	37.2	45.7	42.2	23.2
Cerium-141, -144—praseodymium-144-----	7.9-8.1	3,915- 4,491	99.9	99.9	99.5	99.8
Barium-140—lanthanum-140-----	7.9-8.2	4,644-10,205	94.8	74.5	65.7	73.8
Cobalt-60-----	8.0-8.2	1,571- 4,792	<sup>2</sup> 92.2	-----	47.8	<sup>3</sup> 30.2
FPM-6 <sup>4</sup> -----	7.2-8.0	4,730-10,375	85.8	76.6	92.1	89.4
FPM-5 <sup>5</sup> -----	2.0-7.2	2,890- 4,220	55.5	39.6	49.3	8.2
Cesium-137—barium-137-----	8.0	13,085	8.6	-----	-----	-----

<sup>1</sup> Iron samples were centrifuged before counting.

<sup>2</sup> 500 p.p.m. metal dust.

<sup>3</sup> 60-minute contact.

<sup>4</sup> Iodine dissolver solution aged 20 days.

<sup>5</sup> Mixed fission product waste containing mainly cesium-137—barium-137, and ruthenium-106—rhodium-106.

NOTE: In pairs of radioisotopes, the first is the parent element, and the second, the daughter. Both are radioactive.



**Table 9. Effect of added clay on removal of radioisotopes <sup>1</sup>**

Radioisotope	Percent removal		
	100 p.p.m.	750 p.p.m.	5,000 p.p.m.
Barium-140—			
lanthanum-140-----	41	58	85
Cadmium-115-----	3	30	64
Cerium-144-----	70-80	86	
Cesium-137-----	38	87	98.0
Scandium-46-----	53	91.7	96.9
Strontium-89-----	2-12	14-22	49-52
Tungsten-185-----	0	4	49
Yttrium-91-----	22-45	56-70	93.6
Zirconium-95—			
niobium-95-----	93.5	99.0	98.0

<sup>1</sup> Local clay added to produce turbidity.

NOTE: In pairs of radioisotopes, the first is the parent element, and the second, the daughter. Both are radioactive.

**Table 10. Removal of mixed fission products**

Mixture	Treatment process	Percent removal
FPM-1 <sup>1</sup> -----	Coagulation and settling plus clay.	61-84
FPM-2 <sup>2</sup> -----	Coagulation and settling-----	9-71
	Coagulation and settling plus clay.	12-73
	do-----	46
	Coagulation and settling plus filtration plus clay.	70-73
FPM-3 <sup>3</sup> -----	Coagulation and settling-----	46
FPM-4 <sup>4</sup> -----	do-----	89
	Mixed cation-anion exchange slurry.	83-99
FPM-5 <sup>5</sup> -----	Coagulation and settling-----	51-59
	Mixed cation-anion exchange slurry.	38
	Metallic dust slurry-----	8-56
FPM-6 <sup>6</sup> -----	do-----	77-92

<sup>1</sup> Iodine dissolver solution.

<sup>2</sup> Synthetic mixture.

<sup>3</sup> 3-year-old fission products mixture.

<sup>4</sup> Iodine dissolver solution aged 30 days.

<sup>5</sup> Mixed fission product waste containing mainly cesium-137—barium-137 and ruthenium-106—rhodium-106.

<sup>6</sup> Iodine dissolver solution aged 20 days.

## Summary and Conclusion

Laboratory studies have shown that conventional water treatment processes may remove varying percentages of radioactive contaminants from water. However, the percentage

removal values have little meaning unless they are related to the initial concentration of the radioactive materials present and to the maximum permissible concentration value prescribed for the individual radioisotope. Generally speaking, unless the initial concentration is very low, certainly several orders of magnitude below the microcurie-per-milliliter range, water treatment processes will be ineffective for reducing radioactive contaminants to acceptable safe limits.

Radioactive materials should be retained as close to their source of production as possible. At present, the practice is to store the materials in tanks. The transfer of radioactivity from the liquid to the solid phase does not eliminate the problem, since suitable storage facilities still must be provided for the radioactive sludges, but it does reduce considerably the area of potential contamination.

To protect large centers of population that depend on sources of water which may become contaminated with radioactive materials, plans should be made now for supplying water from noncontaminated sources. For this purpose, existing ground water supplies may be used; other interconnected water supplies may be piped in; or special provisions should be made to bring in water from outside the area. These precautionary measures are applicable, however, only when radioactive contamination is not great enough to constitute an external hazard to man.

## REFERENCES

- (1) Miller, H. S., Fahnoe, F., and Peterson, W. R.: Survey of radioactive waste disposal practices. *Nucleonics* 12: 68, January 1954.
- (2) Hollis, M. D.: Environmental health. A critique. *Pub. Health Rep.* 66: 400-409, March 30, 1951.
- (3) U. S. National Bureau of Standards: Maximum permissible amounts of radioisotopes in the human body and maximum permissible concentrations in air and water. *Handbook 52*. Washington, D. C., U. S. Government Printing Office, 1953.
- (4) Straub, C. P., Morton, R. J., and Placak, O. R.: Studies on the removal of radioactive contaminants from water. *J. Am. Water Works A.* 43: 773-792, October 1951.
- (5) Eliassen, R., Kaufman, W. J., Nesbitt, J. B., and Goldman, M. I.: Studies on radioisotope removal by water treatment processes. *J. Am. Water Works A.* 43: 615-630, August 1951.

- (6) Eden, G. E., Downing, A. L., and Wheatland, A. B.: Observations on the removal of radioisotopes during the purification of domestic water supplies. I. Radio-iodine. J. Inst. Water Eng. 6: 511-532, November 1952.
- (7) Eden, G. E., Elkins, G. H. J., and Truesdale, G. A.: Removal of radio-active substances from water by biological treatment processes. *Atomics* 5: 133, May 1954.
- (8) Gemmell, L.: Efficiency of filter beds for treating radioactive waste. *Nucleonics* 10: 40-42, October 1952.
- (9) Straub, C. P., Pecsok, D. A., Krieger, H. L., Seal, M. S., and Carter, M. W.: Unpublished data from the Oak Ridge National Laboratory, Oak Ridge, Tenn.
- (10) Hoyt, W. A.: The effects of the lime-soda water softening process on the removal of radioactive strontium-90—yttrium-90. Master of science thesis submitted to the faculty of the North Carolina State College. Raleigh, N. C., The College, 1952.
- (11) McCauley, R. F., Lauderdale, R. A., and Eliassen, R.: A study of the lime soda softening process as a method for decontaminating radioactive waters. Sedgwick Laboratories of Sanitary Science, Massachusetts Institute of Technology Report NYO-4439. Cambridge, Mass., The Institute, 1953.
- (12) Downing, A. L., Wheatland, A. B., and Eden, G. E.: Observations on the removal of radioisotopes during the treatment of domestic water supplies: II. Radiostrontium. J. Inst. Water Eng. 7: 555-572, November 1953.
- (13) Alexander, G. V., Nusbaum, R. E., and MacDonald, N. S.: Strontium and calcium in municipal water supplies. J. Am. Water Works A. 46: 643-654, July 1954.
- (14) Friend, A. G.: Report on the investigation of the removal of iodine ( $I^{131}$ ) and strontium ( $Sr^{90}$ ) from water by ion exchange resins. Master of science thesis submitted to the faculty of the Virginia Polytechnic Institute. Blacksburg, Va., The Institute, 1952.
- (15) Ayres, J. A.: Treatment of radioactive waste by ion exchange. *Indust. Engin. Chem.* 43: 1526, July 1951.
- (16) Lauderdale, R. A., Jr.: Studies on the removal of radioisotopes from liquid wastes by coagulation. *Indust. Engin. Chem.* 43: 1538-1540, July 1951.
- (17) Nesbitt, J. B., Kaufman, W. J., McCauley, R. F., and Eliassen, R.: The removal of radioactive strontium from water by phosphate coagulation. Massachusetts Institute of Technology Report NYO-4435. Cambridge, Mass., The Institute, 1951.
- (18) Lacy, W. J.: Removal of radioactive material from water by slurring with powdered metal. J. Am. Water Works A. 44: 824-828, September 1952.
- (19) Lacy, W. J.: Decontamination of radioactively contaminated water by slurring with clay. *Indust. Engin. Chem.* 46: 1061-1065, May 1954.

## **PHS exhibit**

A new exhibit, Social Workers Help Heart Patients, prepared by the Public Health Service in cooperation with the American Heart Association, is now available.

The exhibit is designed to stimulate and extend social services to heart patients. It is suitable for use at social work, heart association, medical, nursing, hospital, welfare, and other professional conferences and health fairs.

Shown for the first time at the National Conference of Social Work in June at San Francisco, the exhibit is approved for use by the American Association of Medical Social Workers. It was produced by the Heart Disease Control Program of the Division of Special Health Services, Bureau of State Services.



Specifications: 3-panel exhibit on legs, 7 feet high, 9 feet wide. Total shipping weight 75 pounds. Borrowers must pay insurance and shipping costs both ways. Available with educational materials through local heart associations, the American Heart Association, 44 East 23d Street, New York 10, N. Y., or the Heart Disease Control Program, Public Health Service, U. S. Department of Health, Education, and Welfare, Washington 25, D. C.

# Progress in Reporting Mental Hospital Statistics

*Fifth Annual Conference of  
Mental Hospital Statisticians,  
Bethesda, Md., May 25-26, 1955*

DEVELOPMENTS in the field of mental hospital statistics and plans for future activities were the major areas of discussion at the Fifth Annual Conference of Mental Hospital Statisticians in Bethesda, Md., May 25-26, 1955, held under the sponsorship of the National Institute of Mental Health, National Institutes of Health, Public Health Service.

The conference was attended by delegates from the 17 member States forming the Model Reporting Area for Mental Hospital Statistics, and by unofficial observers from 7 other States and a representative of the Veterans Administration (see inset).

Emphasizing the contribution of State statisticians in collecting and publishing data, Dr. R. H. Felix, director of the institute, called attention to signs of the Nation's awakened interest in the whole area of mental health. The legislature in New York State has appropriated a considerable sum of money to be matched with local funds, for the development of a large-scale community mental health program. Other States may follow this precedent. Indications of increased interest are also seen at the Federal level, he reported.

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*Prepared by the Current Reports Section, Biometrics Branch, National Institute of Mental Health, National Institutes of Health, Public Health Service. The 1954 conference was reported in the September 1954 issue of Public Health Reports, p. 809.*

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This heightened desire to do something about an age-old problem has brought the realization that trained personnel, particularly biostatisticians, are in short supply. It is urgent that State mental hospital administrators provide statistical programs with much needed personnel and equipment and that they recognize the key position of the statistician in the fight against mental illness.

## Recommended Cohort Studies

The Cohort Study Committee, appointed at the 1954 conference, reported on the types of uniform cohort studies to be produced by members of the model reporting area and the types of tabulations which should be required of these States.

Cohort studies, in a mental hospital, are studies in which groups of patients with common characteristics—these might be first admissions of a specified year with given age, sex, and diagnosis—are followed from the date of admission through their hospital experience to a specified end point, such as trial visit, discharge, or death, in order to determine their disposition within specified periods of time after admission.

The committee agreed that the analytical procedures involved in cohort studies are appropriate to the mental hospital situation and that all approaches to these studies are based on simple, basic movement data, which can be calculated manually—a particular advantage if

the hospital does not have access to machine tabulation equipment. Cohort studies permit development of a series of release, death, retention, and readmission rates; they permit more accurate prognoses on groups of patients for the benefit of the medical staff, the patients' families, and others.

Properly designed cohort studies can be used by a State desiring to evaluate its mental hospital operations, for program evaluation and budget justification, for evaluation of different therapeutic programs, for interhospital and interstate comparisons, and for many important areas of research.

The committee recommended that all model reporting area States attempt to develop cohort studies. Earlier in the conference only a few delegates had reported preliminary attempts to analyze data on hospital admissions on a cohort basis.

The recommended studies would be studies of first admissions over a 3-month period (preferably April, May, and June) in a given year or longer, if the longer time is required for adequate sample size. The committee suggested that all States adopt the cohort study approach used at the Warren State Hospital, Warren, Pa., and that States with adequate mechanical facilities and sufficient staff undertake in addition the types of studies made by the Ohio Department of Welfare. When data are recorded in sufficient detail, States might consider producing cohort studies where both the Warren and Ohio approaches are used.

By tracing the outcome of hospitalization of patients admitted over the past 40 years, the Warren study has furnished a veritable gold mine of information to the hospital, the State legislature, and the public. The approach is that of followup from date of admission to date of first significant release, with tabulations by number of months of hospital residence. With this type of study, one can answer the question: What proportion of first admissions will have attained their first significant release within the first 12 months following admission? Date of first significant release is defined as date of placement on convalescent leave (indefinite leave), direct discharge or escape from which the patient does not return within 30 days, whichever comes first, or death in the hospital.

From the cohort studies in Ohio, which determine the status of the patient at stated intervals of time irrespective of his movement to and from the hospital during the intervals covered by the period of observation, one could answer these questions: What proportion of such admissions 1 year after admission and on subsequent anniversaries have been in the hospital continuously? What proportion are in any State mental hospital subsequent to release? What proportion are on leave? What proportion are discharged without subsequent return to a hospital? What proportion died in or out of a State mental hospital?

### **Routine Tabulations Desired**

The committee recommended that, if more and more resources—personnel, time, and money—were to be put into cohort studies, the number of routine tabulations now requested from member States should be reduced. Certain routine tabulations would, of course, continue to be necessary for the State's own administrative use and for the institute to use in compiling its national summaries.

The committee recommended that only certain tables be prepared and submitted to the institute every year and that other tables be submitted once every 5 years, commencing with 1955. A total of 9 tables would be submitted annually.

On an annual basis, a member State will submit a financial statement and a statement of personnel for each of its State mental hospitals so as to provide the institute with data for comparing maintenance costs and personnel ratios in the model reporting area. In addition, States are to submit an annual tabulation on the movement of patient population, by sex.

Separate tabulations for males and females are to be submitted for the following tables, the first group on an annual basis, the second on a 5-year basis:

### **ANNUALLY**

First admissions during the year by age at admission and by mental disorder.

Readmissions during the year by age at current admission and by mental disorder.

Resident patients at end of year by age at end of year and by mental disorder.

## EVERY 5 YEARS

Discharges by net length of time in hospital and by mental disorder—first admissions.

Discharges by net length of time in hospital for current admission and by mental disorder—readmissions.

Deaths in hospital during the year by age at death, net length of stay for current admission, and selected mental disorder.

Deaths in hospital during the year by cause of death, age at death, and selected mental disorder.

Resident patients at end of year by age at end of year, time on books from date of admission, and selected mental disorder.

The report of the Cohort Study Committee was approved and accepted by the conference.

## Statistics for Consumers

The Committee on Presentation of Lay Materials, another committee appointed at the 1954 conference, stressed the need for having the chief statistician in the State mental hospital system be responsible for the preparation of statistical materials from the point of collection through to the point of final presentation so as to assure valid interpretation. The statistician should not assume the role of a public relations expert. He should provide the basic statistical data needed to answer questions about various aspects of the mental health program and as much interpretative material as necessary to those persons preparing information materials for public consumption.

The committee specifically recommended:

That the National Institute of Mental Health give attention to the possibility of sponsoring in representative communities a number of surveys to obtain much needed data on the incidence and prevalence of mental illness and mental deficiency. Planning for needs and facilities makes it necessary that statistics be up to date, but the only data now available come from several outdated and noncomparable surveys.

That the institute require from each member State certain basic summary totals within 1 to 3 months after the end of the fiscal year in order to facilitate the prompt release of information to the press and national associations. The data of national interest would include total first admissions, readmissions, discharges,

deaths, patients in residence and staff personnel at end of year, estimated per capita maintenance expenditures, and estimated financial expenditures. States not members of the area might also be interested in submitting such information.

That the institute consider the sponsoring of studies that would help in determining the most desirable methods of presenting statistical information. Two types were specified—those concerned with evaluating types of presentation in the field of mental hospital statistics and those concerned with determining which particular formats, layouts, and other pertinent aspects of the presentations attract the greatest audiences, are longest remembered, and assist in effecting action.

In the discussion that followed it was pointed out that several new studies are being carried out on prevalence and incidence of mental illness. Among these are the studies by Redlich in the New Haven area, by Rennie in New York City, and by the New York State Mental Hygiene Commission in Syracuse.

There is a body of knowledge available in the studies that the Public Health Education Branch of the Public Health Service has made on evaluating the effectiveness of various types of health education materials as well as in studies which advertising and psychological research personnel have made on presentation techniques. Copies of some of these studies would be made available to area States to see whether the general principles embodied therein are applicable to statistical presentation.

Discussion centered on the problem of how differences in administrative policies among the States, kind of patients admitted, types of facilities available, adequacies of staffs, and so forth, can affect the various indexes used in interstate comparisons of mental hospital accomplishments. Traditionally, in the tabulations published by the Bureau of the Census from 1923 to 1947 and continued by the National Institute of Mental Health since 1947, data for State mental hospitals have not been combined with data from county mental hospitals and from the receiving or psychopathic type of mental hospital because of lack of comparability. However, since changes in function have

## Participants in the Conference

### Model Reporting Area

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Robert Glass, procedures analyst, State Department of Mental Health, Lansing, Mich.

Thyrza Tyrrell, institutions statistician, State Department of Public Welfare, St. Paul, Minn.

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Donald D. Tolliver, director of biometrics, State Department of Mental Health, Oklahoma City, Okla.

Gertrude H. Thompson, statistician, research and statistics, State Department of Welfare, Harrisburg, Pa.

H. H. Ullom, biometrics supervisor, Board for Texas State Hospitals and Special Schools, Austin, Tex.

Edna M. Lantz, statistician, State Department of Mental Hygiene and Hospitals, Richmond, Va.

John W. Mannering, chief statistician, bureau of research and statistics, State Department of Public Welfare, Madison, Wis.

### Other participants

Nelson A. Johnson, director of social service, Warren State Hospital, Warren, Pa.

Morton Robins, chief, Resources and Evaluation Division, Reports and Statistics Service, Veterans Administration, Washington, D. C.

### Unofficial observers

Florence R. Taylor, chief, mental health statistics, State Department of Mental Health, Hartford, Conn.

Beatrice Harwood, statistician, State Department of Mental Health, Louisville, Ky.

David B. Hoover, biostatistician, State Department of Mental Hygiene, Baltimore, Md.

Thomas F. Pugh, M.D., director, division of medical statistics and research, State Department of Mental Health, Boston, Mass.

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Robert E. Patton, assistant director, bureau of statistics, State Department of Mental Hygiene, Albany, N. Y.

Margaret F. Allen, director of statistical services, State Department of Mental Health, Nashville, Tenn.

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### National Institute of Mental Health

R. H. Felix, M.D., director.

Morton Kramer, Sc.D., chief, Biometrics Branch.

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occurred in recent years so that some of these hospitals are now operating much the same as the State hospitals, the institute agreed to produce for 1954 and thereafter tabulations for public hospitals combining data for all of the institutions functioning in the same general way.

In discussing the difficulties of comparing improvement and release rates on an interstate basis, it was brought out that there may be considerable variation in the degree of psychiatric impairment at the time of admission as well as at time of release, and this, too, would affect interstate comparisons. A committee appointed to look into this problem will report to the 1956 conference.

The report of the Committee on Presentation of Lay Materials was approved and accepted by the conference.

### Reporting Area Tabulations

The Biometrics Branch of the institute presented an analysis of tabulations based on 1953 material from eight member States. In view of some of the difficulties the staff had encountered in comparing this material, the need for the cohort type of analysis was again apparent, and the need for further information regarding administrative practices in the various States was pointed up. Perhaps some of the problems of noncomparability can be eliminated by selecting data pertaining to specific groups of patients rather than attempting to compare all patients in one State mental hospital system with all patients in another system.

Among the editing problems encountered by the biometrics staff working with the State tabulations were failure to convert the old diagnostic terms to the new psychiatric nomenclature, failure to give data in the age and diagnostic breakdowns requested, lack of correspondence between the time periods of the schedules submitted and the time periods specified on the instructions, and lack of agreement among the tabular totals for age, sex, or diagnosis, on the schedules submitted by a State.

The need for greater care and accuracy in preparing schedules was stressed.

### The Progress Reported

The States represented at the conference last year had indicated the need for certain statistical data on residents who were receiving inpatient care for mental illness under the auspices of the Veterans Administration. As a result the Veterans Administration, through the institute, has supplied the area States with needed and useful tabulations on patients resident in and discharged from VA hospitals. This information gives a more complete picture of the hospitalized mentally ill resident in a member State regardless of place of hospitalization. It was agreed that data on resident patients by claimed residence of the veteran would be the most useful material to be obtained on a yearly basis and that other data might be made available, as needed, at less regular intervals.

Delegates reported on developments and operating problems in their State statistical departments. Additional personnel, space, equipment, and duties have been added in some of the departments. The hospitals in one State now use mark-sense punchcards for routine reporting to the central statistical office, thus making it possible to gather more information per patient with less personnel. The statistical forms for hospital reporting in another State have been revised so that much information can be precoded, thus saving clerical time.

Illustrative of the view expressed at the conference that States have learned to work together for mutual benefit is the fact that since 1951 the model reporting area has grown from 11 to 17 States. Two States, Minnesota and Oklahoma, have joined the area since the 1954 meeting. Seven other States are in the process of developing their central reporting systems. Before too long, it can be expected that at least one-half of the 48 States will have satisfied the criteria for membership in the area.



# Milk Sanitation Honor Roll for 1953-55

Fifty communities have been added to the Public Health Service milk sanitation "honor roll" and 71 communities on the previous list have been dropped. This revision covers the period from July 1, 1953, to June 30, 1955, and includes a total of 257 cities and 64 counties.

Communities on the "honor roll" have complied substantially with the various items of sanitation contained in the Milk Ordinance and Code recommended by the Public Health Service. The State milk sanitation authorities concerned report this compliance to the Public Health Service. The rating of 90 percent or more, which is necessary for inclusion on the list, is computed from the weighted average of the percentages of compliance. Separate lists are compiled for communities in which all market milk sold is pasteurized and for those in which both raw milk and pasteurized milk is sold.

The recommended milk ordinance, on which the milk sanitation ratings are based, is now in effect through voluntary adoption in 419 counties and 1,594 municipalities. The ordinance also serves as the basis for the regulations of 34 States and 2 Territories. In 11 States and the 2 Territories it is in effect statewide.

The ratings do not represent a complete measure of safety, but they do indicate how closely a community's milk supply conforms with the standards for grade A milk as stated in the recommended ordinance. High-grade pasteurized milk is safer than high-grade raw milk because of the added protection of pasteurization. The second list, therefore, shows the percentage of pasteurized milk sold in a community which also permits the sale of raw milk.

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*This compilation is from the Division of Sanitary Engineering Services of the Bureau of State Services, Public Health Service. The previous listing was published in Public Health Reports, March 1955, pp. 337-340. The rating method was described in Public Health Reports 53: 1386 (1938). Reprint No. 1970.*

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Although semiannual publication of the list is intended to encourage communities operating under the recommended ordinance to attain and maintain a high level of enforcement of its provisions, no comparison is intended with communities operating under other milk ordinances. Some communities might be deserving of inclusion, but they cannot be listed because no arrangements have been made for determination of their ratings by the State milk sanitation authority concerned. In other cases, the ratings which were submitted have lapsed because they were more than 2 years old. Still other communities, some of which may have high-grade milk supplies, have indicated no desire for rating or inclusion on this list.

The rules for inclusion of a community on the "honor roll" are:

1. All ratings must be determined by the State milk sanitation authority in accordance with the Public Health Service rating method, which is based upon the grade A pasteurized milk and the grade A raw milk requirements of the Public Health Service milk ordinance. (A departure from the method described consists of computing the pasteurized milk rating by weighting the pasteurization plant rating twice that of the raw milk intended for pasteurization.)

2. No community will be included in the list unless both its pasteurized milk and its retail raw milk ratings are 90 percent or more. Communities in which only raw milk is sold will be included if the retail raw milk rating is 90 percent or more.

3. The rating used will be the latest submitted to the Public Health Service, but no rating will be used which is more than 2 years old. (In order to promote continuous rigid enforcement rather than occasional "cleanup campaigns," it is suggested that when the rating of a community on the list falls below 90 percent, no resurvey be made for at least 6 months. This will result in the removal of the community from the subsequent semiannual list.)

4. No community will be included on the list whose milk supply is not under an established



program of official routine inspection and laboratory control provided by itself, the county, a milk control district, or the State. (In the absence of such an official program there can be no assurance that only milk from sources rating 90 percent or more will be used continuously.)

5. The Public Health Service will make occasional check surveys of cities for which ratings of 90 percent or more have been reported by the State. (If the check rating is less than

90 percent, but not less than 85, the city will be removed from the 90-percent list after 6 months unless a resurvey submitted by the State during this probationary period shows a rating of 90 percent or more. If the check rating is less than 85 percent, the city will be removed from the list immediately. If the check rating is 90 percent or more, the city will be retained on the list for 2 years from the date of the check survey, unless a subsequent rating during this period warrants its removal.)

## Communities awarded milk sanitation ratings of 90 percent or more, July 1953-June 1955

### 100 PERCENT OF MARKET MILK PASTEURIZED

<i>Community</i>	<i>Date of rating</i>	<i>Community</i>	<i>Date of rating</i>	<i>Community</i>	<i>Date of rating</i>
<i>Alabama</i>		<i>Georgia—Continued</i>		<i>Iowa</i>	
Auburn.....	9-24-1953	Valdosta.....	4-29-1954	Des Moines.....	8-12-1953
<i>Arkansas</i>		Waycross.....	2- 4-1954	Dubuque.....	12- 2-1954
Fort Smith.....	8-26-1954	<i>Idaho</i>		Sioux City.....	9-18-1953
<i>Colorado</i>		Jerome.....	11-24-1954	Waterloo.....	10- 7-1953
Boulder County.....	2-25-1955	Moseow.....	9- 1-1953	<i>Kentucky</i>	
Colorado Springs.....	1-20-1954	<i>Indiana</i>		Bardstown.....	3- 1-1955
Denver.....	11- 3-1953	Bedford.....	8-30-1954	Bowling Green.....	1- 7-1954
Grand Junction and		Bloomington.....	6- 1-1954	Brandenburg.....	8-12-1954
Mesa County.....	4-15-1954	Cooperative Grade A		Campbellsville.....	4- 8-1955
Las Animas-Huerfano		Milk Program.....	6-28-1954	Frankfort and Franklin	
Counties.....	3- 9-1954	Holland		County.....	7-23-1953
Weld County.....	11-25-1953	Huntingburg		Fulton County.....	1-21-1954
<i>District of Columbia</i>		Jasper		Georgetown.....	10-16-1954
Washington.....	3-15-1954	Tell City		Hickman.....	1-20-1954
<i>Florida</i>		Crawfordsville.....	4-20-1955	Hopkinsville.....	12-10-1953
Jacksonville.....	8-27-1954	Edinburg.....	12- 1-1953	Leitehfield.....	11-24-1954
<i>Georgia</i>		Elkhart.....	9- 1-1954	Louisville and Jefferson	
Albany.....	12-16-1954	Evansville.....	12- 3-1954	County.....	4- 7-1954
Athens-Clarke County..	4- 8-1955	Franklin.....	12- 1-1953	Monticello.....	7-13-1954
Atlanta.....	10-17-1953	Greeneastle.....	5-19-1954	Morgantown.....	1- 8-1954
Augusta-Richmond		Huntington.....	9-25-1953	Murray.....	4-29-1954
County.....	10-30-1953	Indianapolis.....	9-15-1954	Newport and Campbell	
Bainbridge.....	8- 6-1953	La Fayette and West		County.....	11- 3-1953
Cairo.....	2-25-1955	Lafayette.....	10-14-1954	Owensboro.....	6-18-1954
Calhoun, Gordon		Logansport.....	4- 9-1954	Padueah and McCrack-	
County.....	7-16-1954	Madison.....	8- 1-1954	en County.....	8-18-1953
Columbus.....	2-17-1955	Martinsville.....	11-20-1953	<i>Louisiana</i>	
Dublin.....	3-18-1955	Mount Vernon.....	10-18-1954	Calcasieu Parish.....	8- 1-1954
Elberton.....	2- 9-1954	Muncie.....	11-23-1954	Lincoln Parish.....	9- 1-1954
La Grange.....	7-15-1954	Nappanee.....	11- 1-1953	Rapides Parish.....	5- 1-1954
Savannah, Chatham		New Castle.....	11- 1-1954	St. Martin Parish.....	7- 1-1954
County.....	8-12-1954	Shelbyville.....	9- 1-1954	Vermilion Parish.....	9- 1-1954
Statesboro.....	12- 3-1954	Terre Haute.....	2- 3-1955	<i>Mississippi</i>	
Swainsboro, Emanuel		Valparaiso.....	5-13-1954	Aberdeen.....	10- 7-1953
County.....	5- 5-1954	Vincennes.....	3- 7-1955	Amory.....	10- 7-1953
				Boonesville.....	9- 9-1953

Communities awarded milk sanitation ratings of 90 percent or more, July 1953-June 1955—Con.

100 PERCENT OF MARKET MILK PASTEURIZED

<i>Community</i>	<i>Date of rating</i>	<i>Community</i>	<i>Date of rating</i>	<i>Community</i>	<i>Date of rating</i>
<i>Mississippi—Continued</i>		<i>North Carolina—Continued</i>		<i>Tennessee—Continued</i>	
Brookhaven.....	3- 4-1954	Rocky Mount.....	9- 8-1953	Maryville-Alcoa.....	11-23-1954
Clarksdale.....	10-13-1954	Wilson County.....	9-18-1953	Memphis.....	3-25-1954
Columbus.....	3-26-1954			Milan.....	6-30-1954
Greenville.....	9-14-1954	<i>Oklahoma</i>		Morristown.....	5-26-1954
Greenwood.....	4-19-1954	Ardmore.....	4-21-1954	Murfreesboro.....	7- 2-1953
Iuka.....	7- 9-1953	Duncan.....	1-19-1954	Nashville and David-	
Louisville.....	9-16-1953	Guthrie.....	5-25-1954	son County.....	10-28-1953
Macon.....	6-11-1954	Mangum.....	11-18-1954	Newbern.....	10-28-1954
Meadville.....	10-13-1954	Okmulgee.....	10-13-1953	Newport.....	10- 5-1954
Ruleville.....	4-22-1954	Seminole.....	10- 1-1954	Shelbyville.....	6- 9-1954
Vicksburg.....	7-10-1954	Sulphur.....	2-17-1955	Sparta.....	5- 5-1954
Winona.....	11-24-1953	Tulsa.....	7-28-1954	Springfield.....	7- 6-1953
				Sweetwater.....	10- 7-1954
<i>Missouri</i>		<i>Oregon</i>		Trenton.....	6-30-1954
Cape Girardeau.....	8-11-1954	Klamath Falls.....	5- 7-1954	Union City.....	8-12-1953
Kansas City.....	9-13-1954			Winchester.....	10-21-1954
St. Joseph.....	7-16-1953	<i>South Dakota</i>			
St. Louis.....	12-10-1953	Aberdeen.....	8-28-1954	<i>Texas</i>	
Springfield.....	11-25-1954	North Hills Unit.....	7-20-1953	Brownwood.....	7-16-1954
		Belle Fourche		Bryan.....	8-30-1954
		Deadwood		Cleburne.....	11-19-1954
		Lead		Dallas.....	9-29-1954
		Spearfish		Denison.....	6-24-1954
		Sturgis		Falfurrias.....	1-21-1955
				Galveston.....	7-24-1954
		Sioux Falls.....	10-26-1954	Harlingen.....	1-26-1955
		Sisseton.....	8-24-1954	Houston.....	5-28-1954
				Huntsville.....	12- 3-1954
		<i>Tennessee</i>		Jacksonville.....	12-11-1954
		Athens.....	8-10-1954	Kerrville.....	8-13-1954
		Bristol.....	11- 5-1953	Kilgore.....	7-14-1954
		Chattanooga.....	12- 3-1954	Lufkin.....	3- 3-1955
		Clarksville.....	2-10-1955	Midland.....	1-21-1955
		Cleveland.....	10-13-1954	Mineral Wells.....	12-14-1954
		Clinton.....	4-21-1954	Nacogdoches.....	9- 3-1954
		Columbia.....	5-19-1954	New Braunfels.....	9- 2-1954
		Covington.....	11-12-1954	Odessa.....	1-21-1955
		Cowan.....	10-21-1954	Plainview.....	11- 2-1954
		Dandridge.....	11-10-1953	Port Arthur.....	6-29-1954
		Decherd.....	10-21-1954	San Antonio.....	2- 8-1955
		Dyersburg.....	10-29-1954	San Benito.....	1- 8-1955
		Franklin.....	5-20-1954	Sweetwater.....	11-17-1954
		Gallatin.....	7- 8-1953	Texarkana.....	4- 5-1955
		Gatlinburg.....	10-16-1954	Tyler.....	10-22-1954
		Greenville.....	6- 5-1954	Victoria.....	11-24-1954
		Humboldt.....	6-30-1954	Wichita Falls.....	3- 8-1955
		Jefferson City.....	5-26-1954		
		Johnson City.....	9-23-1954	<i>Utah</i>	
		Kingsport.....	10- 8-1953	Ogden.....	11-10-1953
		Knoxville.....	8- 6-1953	Salt Lake City.....	3-30-1954
		Lebanon.....	8-27-1954		
		Lewisburg.....	6-10-1954	<i>Virginia</i>	
		Livingston.....	1-27-1954	Abingdon.....	11- 5-1953
		Loudon.....	5- 6-1954	Bristol.....	11- 5-1953
		Manchester.....	10-21-1954		
<i>Nevada</i>					
Ely, McGill, and Ruth..	4- 6-1954				
<i>North Carolina</i>					
Avery County.....	1-15-1954				
Beaufort County.....	3-31-1955				
Bertie County.....	3-31-1955				
Burke County.....	1-15-1954				
Charlotte.....	1- 4-1954				
Chatham County.....	4- 5-1955				
Clay County.....	10-27-1953				
Craven County.....	2-12-1954				
Cumberland County..	1-20-1954				
Durham County.....	7-27-1954				
Forsyth County.....	1-31-1955				
Granville County.....	7-21-1953				
Guilford County.....	6-28-1954				
Henderson-Transyl-					
vania Counties.....	2-18-1954				
Iredell County.....	11-17-1954				
Lec County.....	4- 8-1955				
Lenoir County.....	1- 7-1955				
Mitchell County.....	10-23-1953				
Nash County (exclud-					
ing Rocky Mount)..	9-17-1953				
New Hanover County..	5-28-1954				
Northampton County..	4-21-1954				
Orange County.....	4- 5-1955				
Person County.....	4- 5-1955				
Richmond County.....	2- 2-1954				
Rockingham-Caswell					
Counties.....	3-12-1954				

# Communities awarded milk sanitation ratings of 90 percent or more, July 1953-June 1955—Con.

## 100 PERCENT OF MARKET MILK PASTEURIZED

<i>Community</i>	<i>Date of rating</i>	<i>Community</i>	<i>Date of rating</i>	<i>Community</i>	<i>Date of rating</i>
<i>Virginia—Continued</i>		<i>Virginia—Continued</i>		<i>Washington—Continued</i>	
Buena Vista.....	8- 4-1953	South Boston.....	3- 8-1954	Port Angeles.....	9-10-1953
Front Royal.....	8- 7-1953	Staunton.....	6-25-1954	Spokane.....	9-16-1954
Lexington.....	8- 4-1953	Suffolk.....	7- 1-1954	Walla Walla.....	10-15-1953
Luray.....	8- 7-1953	Waynesboro.....	6-25-1954	Whitman County....	10-14-1954
Marion.....	11-18-1953	Williamsburg.....	10- 9-1953		
Norfolk.....	5-18-1954			<i>Wisconsin</i>	
Portsmouth.....	5-18-1954	<i>Washington</i>		Green Bay.....	9-17-1953
Richmond.....	4-16-1954	Bellingham.....	8-21-1953	Madison.....	10-26-1953
Roanoke.....	8-20-1954	Cowlitz County.....	7-30-1953		

## BOTH RAW AND PASTEURIZED MARKET MILK

<i>Community and percent of milk pasteurized</i>	<i>Date of rating</i>	<i>Community and percent of milk pasteurized</i>	<i>Date of rating</i>	<i>Community and percent of milk pasteurized</i>	<i>Date of rating</i>
<i>Florida</i>		<i>Missouri</i>		<i>Tennessee</i>	
Escambia County, 99.6.....	6-30-1954	Moberly, 94.2.....	3- 1-1955	Harriman, 98.....	10-15-1953
Manatee County, 99.57.....	8-21-1953			Jackson, 98.6.....	11- 5-1953
		<i>Montana</i>		Kingston, 96.....	10-14-1953
		Missoula, 99.....	11- 5-1954	McMinnville, 90.....	5- 5-1954
<i>Georgia</i>		<i>North Carolina</i>		<i>Texas</i>	
Carroll County, 97.5..	3-24-1955	Davidson County, 96.4.....	7-28-1953	Abilene, 98.9.....	6-15-1954
Cartersville, 97.7....	1-26-1955	Haywood County, 95..	11- 5-1953	Amarillo, 98.....	5-11-1954
Cedartown, 97.7....	11-19-1954	Moore County, 93.6...	3-12-1954	Austin, 98.6.....	6-11-1954
Gainesville-Hall County, 92.1.....	5-20-1955	Robeson County, 96.8..	1-11-1954	Brady, 94.....	8- 7-1954
Griffin, 98.2.....	9- 3-1954	Vance County, 91.2...	7-22-1953	Childress, 83.4.....	4-22-1955
Macon, 99.7.....	6-23-1955	Wilkes County, 91.9..	9- 2-1953	Fort Worth, 99.97....	4-28-1954
Marietta, 96.2.....	5- 4-1954			Gainesville, 95.....	12- 1-1954
Newnan, 92.8.....	7-23-1954	<i>Oklahoma</i>		Gladewater, 98.8....	7-14-1954
Thomaston, 87.4.....	6-17-1954	Ada, 87.....	7- 8-1953	Longview, 99.6.....	7-14-1954
Toccoa-Stephens County, 88.....	4- 9-1954	Elk City, 98.8.....	4-29-1954	Lubbock, 99.....	8-20-1954
Washington-Wilkes County, 99.....	9-24-1953	Enid, 96.6.....	3-30-1954	Marshall, 91.....	4-26-1954
Winder-Barrow County, 98.5.....	3-10-1955	Henryetta, 93.....	3-14-1955	Palestine, 95.1.....	6-15-1954
		Lawton, 99.2.....	12-27-1954	Paris, 94.8.....	12- 8-1954
		Muskogee, 99.6.....	1-21-1955	Waco, 99.....	7-28-1954
		Norman, 99.....	1-27-1955		
		Oklahoma City, 97.7..	11-12-1954	<i>Virginia</i>	
		Ponca City, 92.6.....	2- 4-1954	Lynchburg, 98.8.....	12- 1-1954
		Shawnee, 98.9.....	12-17-1953		
		Stillwater, 97.....	4-29-1954	<i>Washington</i>	
				Tacoma, 99.7.....	7-16-1954
		<i>Oregon</i>			
		Portland, 99.4.....	9-30-1954	<i>West Virginia</i>	
				Kanawha County, 98..	6-25-1954

NOTE: In these communities the pasteurized market milk shows a 90-percent or more compliance with the grade A pasteurized milk requirements, and the raw market milk shows a 90-percent or more compli-

ance with the grade A raw milk requirements, of the Milk Ordinance and Code recommended by the Public Health Service.

Note particularly the percentage of the milk pasteurized in the various

communities listed. This percentage is an important factor to consider in estimating the safety of a city's milk supply. All milk should be pasteurized, either commercially or at home, before it is consumed.

# *public health pioneering*

## A Southern Heritage

### APHA SOUTHERN BRANCH CONFERENCE REPORT

To commemorate a pioneering heritage and a history of progress, the Southern Branch of the American Public Health Association chose for its 23d annual meeting in New Orleans on May 11, 1955, the occasion of the 100th anniversary of the establishment of the Louisiana State Board of Health.

Several hundred delegates attended from Alabama, Arkansas, District of Columbia, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, Missouri, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, West Virginia, and nations to the south.

In a review of the southern heritage, Dr. Ben Freedman, director of the public health training center, Louisiana State Department of Health, pointed out that many health regulations were applied in the early Spanish settlements and that the

Virginia, Maryland, and Carolina provinces pioneered with health measures under the British Crown. In the history of the United States, the people of the States now comprising the APHA Southern Branch appointed the first health officer, the first local board of health, and the first State board of health.

Other speakers pointed out that southern economic progress, handicapped for years not so much by climate itself as by diseases peculiar to a warm, humid climate, has been accelerated by control of such diseases. By such means, public health services have released southern energy and enterprise to break the vicious circle of illness that begets poverty that begets illness.

Seventeen of the papers read at the meeting are briefed here. Several others will be published in full at later dates.

## The Past is Prologue— Theme of Address

**brief** My title comes naturally to one from a State facetiously referred to by us natives as "a vale of humility between two mountains of conceit." Our past achievements serve well only as they spur us to build even more soundly, never when they lull us into complacency.

Edwin A. Alderman, 50 years ago, set the goal of the south when he said that its supreme need is for trained men, men with prevision to see things before they happen, men who think with their brains and not their emotions, men who find out about things before settling them instead of settling them first and finding out about them afterward, men eager to build for the future rather than to chant the requiem of a past age.

It is definitely not disrespectful or ungrateful but actually necessary to orientation and alertness when we take frequent looks all around, including a quick glance backward, as we move forward. It is unfortunate that even a few health workers assume that the really important services in public health began the day he or she was hired. Since an appreciation of history tends to dispel such arrogance, we need more of such appreciation, and only then can we safely admit that we are doing more and better work than the early pioneers.

The Southern Branch of the American Public Health Association is entirely dependent on volunteer and drafted service for its activities and growth, and all have come through magnificently in spite of the many handicaps of heavy responsibilities in various types of jobs. In our large organization no one per-

son could ruin it, but it takes devoted service from many to succeed day by day.

Our Southern Branch area has pioneered in environmental sanitation, control of intestinal parasites, State and local—and particularly rural—health department organization, immunizations, school health services, oral hygiene, control of insect pests in a subtropical area. All of these achievements have been under medical leadership. Some we did because we had to.

Our pleasantly warm climate, heavy rainfall, and soil types encourage outdoor living and certain disease hazards. The relative backwardness in and near the tropics has been due more to insect enemies than to climate. In the Tennessee Valley it was demonstrated that the former heavy morbidity and mortality from malaria around tropical and subtropical impoundments is controllable. The growth of tribes or towns and cities has been limited sharply to their ability and willingness safely to dispose of human wastes. As we in our lovely area bring insects and environmental pollution under effective control, progress will become limitless—agriculturally, industrially, and in human health and efficiency.

Private medical practitioners in our area have stimulated and promoted the development of sound local health departments. They have given of their time to serve on State and local health boards and to cooperate in case finding and other services. Private practice and public health have jointly brought communicable diseases under relative control.

We now have the organization, the experience in medical leadership, and cooperative teamwork to pioneer in the field of chronic disorders and accidents, and to prepare for providing public health services to our aging population.

To develop the ideal child, Socrates is said to have advised starting with the grandparents. For better control of chronic degenerative disorders, we should at least begin with sound parenthood, careful prenatal guidance, and early infant and pre-

school health protection and development.

As we set our sights on the future we can learn much from, and can deservedly be proud of, our pioneering past. Louisiana led the way with the first State board of health; Maryland with the Baltimore City Health Department; Virginia with her smaller type city health department, at Petersburg; Kentucky and North Carolina with early county health departments, in Jefferson and Guilford Counties; and North Carolina with the first strictly rural county health department, in Robeson. Alabama and South Carolina were among the first to attain full State coverage by local health departments—and we might go on. May we do our utmost to become worthy successors to our pioneer predecessors.

## An Era of Responsibility Typifies Public Health

**brief** The era into which we are moving is still too confused to have a single adequate label. Depending on one's point of view, it can be described as the chemical era or the social era or the era of physics or radiological energy.

If we classify the present era as social or an era of social medicine, there is much to substantiate our case. The great variety of names dealing with mental health, the whole person, holistic medicine, and so on merely reflect the scope of the expanded interests which public health has developed.

Louisiana created early a unit of social work in its State health department. New York State now has an anthropologist on the staff of its health department. Departments of preventive medicine in the medical

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*By Roscoe P. Kandle, M.D., deputy commissioner, New York City Department of Health.*

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schools have anthropologists, sociologists, and medical and psychiatric social workers on their staffs doing research in social medicine.

The traditional separation of preventive and therapeutic services is slowly disappearing. Public health is concerning itself increasingly with both secondary and primary prevention of the chronic diseases. The State health department in Idaho has full responsibility for mental health. Public health nurses in Georgia have demonstrated their skill in helping families with post mental hospital experience. On the other hand there has been a further fractionation of many mental health services in many States.

In New York City 11 union-operated health centers provide high-grade diagnostic and ambulant therapy services and are quite successful in getting people to take advantage of periodic physical examinations. In Windsor, Ontario, the Ford Company and the union have negotiated a contract whereby all employees and their dependents will get prepaid hospitalization and complete medical care in the hospital, office, or home. The same care is assured after retirement.

The time has come when public health nursing care of the sick at home must be considered a normal part of the public health program. Visiting nurse associations and health department nursing staffs are uniting to form a single comprehensive nursing service. Certainly, a combined nursing agency can be a means to a better family service.

### *Family Health Center*

The 3-year project now being conducted in Washington County and Hagerstown, Md., by Community Research Associates will give us a better perspective of the intricate complexities of family problems in this era of public health. The project combines research, demonstration, and direct service with the prevention and control of the heavy community burden presented by indigent disability.

During January 1954 about 13 percent of the families in Washington County received service from one of

the community-supported agencies which deal with health, dependency, and maladjustment. About 6 percent of this group were designated "multiproblem" in that they were families with recognized problems, receiving care from agencies working in 2 or more of these 3 fields.

Studies elsewhere have shown a remarkable consistency of this 6 percent of multiproblem families—in getting service as they do from many agencies, in absorbing an enormous and disproportionate amount of community funds and professional staff time. In Washington County these multiproblem families comprise 88 percent of the public assistance caseload, 63 percent of the organized indigent medical care caseload, and 43 percent of the caseload of the agencies dealing with maladjustment.

To a high degree these community agencies—13 local voluntary, 18 local tax-supported, and 24 State—are treating the same families and individuals.

Washington County is in the process of attacking the basic behavioral, social, mental, and environmental problems presented by its problem families through a family health center and a unit of chronic disease control in which rehabilitation will have major emphasis. The center will unite the skills of medicine, public health, rehabilitation, public health nursing, family case work, and will integrate its mental hygiene service with that of the health department.

### *Ingenuity, Courage, Vision*

A 5-year project with similar objectives is under way in Lafayette Parish, Louisiana. It is a remarkable project, stemming from the work of a State interdepartmental committee, which all agencies are pledged to work through. Each agency is to support its part of the plan within the framework of its responsibility to prevent the waste of human resources occurring from the social breakdown of families.

It should be clear to all of us that every health unit is carrying many of these multiproblem families. The children all too frequently repeat much of the pattern of asocial behavior and chronic illness of their

parents. Even superficial reflection will impress us with the great amount of advice, pressure, needling, and direct action which these families receive from many workers, many agencies. Undoubtedly they get conflicting specific directions and counsel.

Few of us will have the opportunity to participate in trials such as those in Maryland and Louisiana, but everybody can take a crack at this tough basic problem. The logical approaches, in actual practice, are simple: recognition of multiproblem families as such, a comprehensive family diagnosis, comprehensive treatment based on this diagnosis, and the kind of leadership and machinery of synthesis necessary to make this treatment possible by a single plan. The difficulties lie in actually working out a way for functioning together to benefit our communities. When we have solved this problem by combining ingenuity, courage, and vision with hard work, we will have realized the most significant of the changing aspects of public health.

## **Local Agency Programs For Accident Prevention**

**brief** Home and farm accidents have emerged as a leading threat to health and personal welfare in the United States in the second half of the 20th century. Home and farm accident deaths outrank all communicable disease deaths in most States. As a killer and crippler of children, home accidents outnumber the next five leading causes of death including motor vehicle accidents. The other large

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group experiencing unusual incidence of home accidents are the aged, and United States figures for 1953 show that 1 out of every 2 persons killed in home accidents was over 50 years of age.

### *Resistance to Program*

In introducing the idea of home accident prevention to the local health departments of North Carolina, the State board of health's accident prevention section staff has found that the misgivings expressed by the local public health personnel fall into two general classes.

The first is the feeling that home accidents and other types of accidents do not actually constitute as real a health problem as do those conditions which can be related more closely to the traditional areas of medical and public health endeavor.

Accidents are, and should be, widely recognized as the concern of those engaged in the manufacture, maintenance, and operation of motor vehicles, the construction and use of highways and public roads, the operation of industrial plants, the conducting of occupational health and safety services, and those with interest in water safety, fire-arm safety, and the host of other safety specialty interests. The public health worker in some instances appears to feel that accidents to the individual in his home environment are not as worthy of the worker's time and attention as are the health problems related directly to bacterial etiology, degenerative conditions, clearly unhealthy physical and mental environment, and other conditions for which it is easier to demonstrate a cause and effect relationship.

The second area of misgiving is perhaps not so easily encompassed. It is expressed in the concern displayed by a number of health department staff members who believe that home accident prevention activities, to be effectually conducted, must be defined in concrete terms within the comprehension of all the staff.

This dubiety seemingly pertains not only to the etiology of accidents where terms such as "accident prone," "accident susceptible," and

"accident liable," are hard to reduce to day-to-day fundamentals, but also to the methods of prevention. In the latter area, one frequently hears much about "education," "motivation," and "integration," and in some instances these terms seem peculiarly nebulous in the light of everyday health department operations.

The conceptions of accident prevention also are colored in many instances by the mass educational and promotional programs which have characterized the focus of over 90 percent of all safety programs in the United States in recent years. That home accident prevention involves more than the mobilization of press, radio, television, and other mass educational media has been hard for some public health administrators to grasp.

Health department reluctance to undertake home safety activities has stemmed from a failure to recognize the rising importance of accidents as a threat to health, a hesitancy to redraft program content to meet these new needs, and the difficulty public health safety leaders have experienced in demonstrating down-to-earth, easily assimilated accident prevention techniques which can be adapted to existing health department programs.

### *Causes of Accidents*

Home and farm accidents can be shown to result from a combination of two factors: human failing, such as physical, mental, or emotional conditions, and environmental hazards, either "built-in" the dwellings or "imported" by way of appliances and furnishings.

Physical conditions such as defective vision, loss of auditory acuity, dizziness, immaturity, feebleness, or other physical incapacity resulting from acute or chronic diseases or conditions easily can be pictured as causing many accidents, particularly among the elderly. That accidents can be ascribed to transient physical conditions such as fatigue, overindulgence, hunger, and sleepiness has been established.

The mental and emotional states which can be related to accidents are perhaps less well understood than

the physical, but again certain examples can be elicited which can be applied readily to accidents or near-accidents within the experience of most health agency employees. These encompass the accidents which result from failure to exercise usually observed precautions due to anger, frustration, anxiety, depression, and preoccupation. These mental and emotional circumstances, existing almost wholly on the conscious level, can only serve to suggest the significance of less clearly defined influences operating within the subconscious. The etiological relationships concerned in accident proneness or susceptibility are within this less well-defined area. However, the existence of such individuals has been demonstrated in a variety of accident research studies.

It seems obvious, however, that home accident prevention programs need not be delayed until all facts pertaining to the so-called prone individual have been established fully.

### *Face-to-Face Education*

Successful home accident prevention activities must combat both human failings and environmental hazards. The approach to the individual and to his home must progress simultaneously on a communitywide front and an individual basis. Health department opportunities for a combination of the face-to-face teaching of safety in association with the mobilization of community resources offer an approach to safety in the home unique in the history of the safety movement in the United States.

In attempting to gain the interest and cooperation of the family members to conduct effective education on home accident prevention, several channels are open to the health department. Certainly, the utilization of mass media, audiovisual aids, displays, posters, exhibits, contests, and other educational enterprises should not be overlooked for whatever value they may have. However, through public health nurses, sanitarians, and other field workers who daily enter hundreds of homes in the community, public health agencies are in a position to mobilize perhaps the most potent educational force yet



brought to bear upon the accident problem.

The public health worker has entered into the home where he or she is received as a family friend who can speak with authority on health matters. With each entry into the home, a situation for learning is created, and in no other setting could the teaching of home safety be more effective. Far-sighted public health authorities have been quick to recognize the implications for safety in almost all of the program areas where health departments are now active.

Maternal and infant supervision, geriatrics, nutrition, environmental sanitation, the hygiene of housing, mental health, insect and rodent control, radiological health, chronic disease control and many other activities have real concern for safety in one or more aspects.

Health workers sensitized to safety objectives and techniques have stated that usually it is not necessary to seek the opportunity to integrate home safety teaching into the home visit. Such opportunities frequently present themselves, and the worker need only be alert to develop the opportunities to their fullest potential.

In some areas, home visits by all disciplines have been used as an opportunity to gain valuable statistical information on family accident experience and to record hazards existing in the home. Such activities not only add to the epidemiological knowledge of home accidents, but also afford another opening for family education.

Group teaching has been demonstrated as a type of interpersonal relationship wherein valuable information may be imparted to all participants. Meetings of public health workers with mothers, parents, and other organized community groups afford an additional chance for home safety teaching to be achieved at its most receptive level.

### *Cooperating Groups*

The health department launching safety activities will find a host of other official agencies and volunteer organizations and individuals with a related safety interest or activity.

The department of motor vehicles, the public schools, the agriculture extension service, industrial commissions and labor groups, welfare departments, city planning and development organizations, housing authorities, and police and fire departments all have a vested interest in some phase of accident prevention. Coordinated planning and action with these official groups and the volunteer agencies can result in economy not only in funds but also in effort.

The precise depth and direction of the community centered safety program will depend in large measure upon the individual community's needs and resources. One single plan effective in all localities is beyond the realm of reasonable expectation. Important, however, is the thought that some organized plan must be formulated to involve actively all those concerned with the solution to this serious health problem.

## **Educating for Home Accident Prevention**

*brief* The National Safety Council's "Accident Facts" informs us that the majority of persons over 65 who die as a result of home accidents are victims of falls. This information seemingly provides the key to the problem of preventing home accidents among the aged, for if we eliminate the causes of falls, it follows that we can cut the home accident death toll in half at one stroke.

A brief look at some of the causes of falls among the aged soon dispels any hope of easy victory, however, for these causes are both physical and environmental in nature. With advancing age, persons are less able

to foresee and protect themselves from accident hazards, and accidents which may cause slight injury to the young very often result in serious injury and death when occurring in later life.

We know, too, that among the aged, feebleness, chronic disease, senility, or acute physical disorders are major contributors to accident incidence. Elderly people, especially those suffering chronic diseases, are affected by errors of judgment and personality changes. Coupled with malfunctioning joints, susceptibility to accidental injury is greatly magnified. Visual and auditory activity is also often diminished, increasing vulnerability to accidental injury.

In a 1954 survey of fatal home accidents in Maryland counties, senility and chronic disease or disability were listed as the most frequent physical factors contributing to accidental injury. Miscalculation, poor or faulty judgment, loss of balance, inability to avoid obstructions, stumbling over objects, unsteadiness, fainting, or just seeming to fall without reason were listed as primary causes of these accidents.

These findings take on new significance when we see that out of a total of 119 fatalities in the 65 and over age group, 91 fatal accidents occurred to persons more than 75 years old. The need for close and continued supervision is obvious.

### *Emphasis on Education*

The most realistic approach to the problem of preventing home accidents among the aged is to determine ways of reducing exposure to unsafe conditions in their environment. Education, with emphasis on educating persons responsible for the care of elderly folk, is the best method. Engineering and enforcement are important to a lesser degree.

Prospective operators of facilities for the care of the aged often consult the health department before beginning to build or remodel. By offering suggestions which take legal standards into account and also reflect understanding of the needs and problems of both operator and patients, we can eliminate many hazards. A similar service to prospec-

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*By J. Charles Judge, chief, home accident prevention unit, Maryland State Department of Health.*

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ve builders of private residences might also be productive of goodwill and increased safety.

In these contacts and in our work with individual families we can suggest adapting home surroundings to the needs of elderly members of the family. Such relatively simple changes as arranging living quarters on one floor, providing a central place for personal belongings, keeping passageways clear and lighted at night will reduce exposure to falls hazards.

More difficult is interpretation to family and community of the emotional needs of the elderly. The older individual needs to feel that he is valued and loved and that he makes a useful contribution to family and community life.

In addition, there is urgent need for codes and regulations which assure the "building out" of safety hazards in the individual home or the institution.

In Maryland, the State board of health has vested responsibility for the licensing of hospitals, nursing, convalescent and care homes in the bureau of medical services and hospitals. The hospital licensing law establishes basic principles of hospital and nursing home construction and operation so as to assure safe and adequate care of patients in places other than their own homes or those of relatives.

The contribution of the health department sanitarian in promulgating and carrying out these regulations is of real value. The Maryland sanitarian inspects the hospital or home before the issuance of a license and annually thereafter on renewal.

### *Health Department Sanitarian*

Much thought is being given to the part sanitarians might take in helping prevent home accidents aside from their institutional activities and general sanitation inspections.

Seagle has pointed out in the *South Carolina Sanitarian* that the sanitarian has good opportunity to observe hazardous conditions or unsafe actions on his daily rounds and that a program of inservice training and a checklist of home hazards would help prepare him to discuss unsafe conditions on the spot and make rec-

ommendations for practical means of correction.

What are some of the points which the sanitarian might keep in mind as he inspects private residences and nursing or care homes?

In connection with construction, he should determine whether electrical, plumbing, and heating installations have been inspected for compliance with local codes, manufacturers' specifications, and the minimum standards set by national boards.

He might call attention of the homeowner or nursing home operator to the need for elimination of dangerous changes in floor level, the need for sufficient electrical outlets to avoid overloading circuits and to eliminate long extension cords.

He might check switches and outlets to see that they are located at sufficient distance from sinks, showers, bath and laundry tubs and yet are accessible to the bedside, doors of entry and exit, and at the head and foot of stairs.

He might look for such booby traps in the environment as doors opening into stairwells, inadequate lighting of stairways and hallways, insecure or missing handrails, loose stair treads, risers that are not of uniform width or height.

He might recommend that scatter rugs be backed with a nonslip material or substance, that they not be placed at the head of stairs, and that flooring have a nonskid finish. He might recommend grab bars for tubs or showers. He might suggest a traffic plan to rid passages or walkways of obstruction.

In the handling and storage of medicine, the sanitarian might ascertain whether containers are clearly and properly labeled and whether medicine cabinets are located near running water to facilitate preparation of prescribed medicine. Are narcotics, sedatives, and other dangerous or habit-forming drugs in a safe place? Are medications no longer in use being promptly discarded?

In connection with fires, which next to falls lead in causing accidental death and extended morbidity, the health department sanitarian

can augment the safety precautions required by the local fire authority or the State insurance commission. In many areas stoves and individual room heaters or space heaters are not acceptable and are a fire hazard. The sanitarian can work with county fire marshals who share our interest in saving lives.

Preventing accidents to the aged is not a task for one agency alone. Its solution will require the contribution of many—every member of the health department, engineers, architects, builders, teachers, individuals responsible for care of the aged, communities responding to the need for providing care facilities for their older citizens. Through such an approach it is reasonable to expect a steady reduction in the accidental injury and death rate among persons in the older age groups.

## **The Relation of Housing To Accident Incidence**

**brief** In Augusta, Ga., a housing study was correlated with an accidental injury study to determine if the accident rate increases as housing standards become poorer.

The housing survey, made by the Richmond County Health Department in 1952 and 1953, classified the housing in two census tracts in the southeastern part of Augusta into five groups—A through E. Class A indicated the best housing and class E, the poorest. This section was selected for the survey because of the varied types of housing it contained. The class of housing was determined by inspection of the structure, dwellings within the structure, and the premises. The dwellings were graded by the penalty point method.

Also available was an up-to-date file the University Hospital of Au-

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*By Henry C. Steel, Jr., B.S., director of the home safety unit, Georgia Department of Public Health.*

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gusta keeps on all accidents treated in the emergency room. Ninety-five percent of the emergency cases in the area are treated by this hospital.

For its analysis, the home safety unit of the Georgia Department of Health selected from the hospital data the accidents occurring in 1953 to the residents of the two surveyed census tracts, V and VI.

The total estimated population of the census tracts was 8,283—6,204 white and 2,079 nonwhite residents. An extremely high percentage of the nonwhite population lived in the lowest class of housing. Eighty-eight percent of all the persons living in class E housing were nonwhite; in class A housing, only 3 percent were nonwhite.

### *General Rate Upward*

Home injuries treated in the hospital's emergency room were the leading type of injury. They almost doubled the rate for motor vehicle injuries—20.9 to 11.8 per 1,000 population.

Although the study found no clear-cut rise in injury rates as the housing, maintenance, occupancy, and dwelling scores decreased, the general rate trend was upward as the housing conditions became poorer.

The total treatment rate for all types of accidents increased steadily through the first four classes of housing—from 43.4 for class A to 76.1 for class D. But for class E housing the total rate showed a sudden drop to 55.5 per 1,000 population.

For home injuries, the rates by class of housing were: A—17.7; B—21.2; C—17.9; D—31; E—25.8. Thus, home accident rates dropped slightly for class C housing, turned back up sharply in class D, and dropped again in class E housing.

Two factors possibly responsible for the differences in injury rates, such as the drop in the rates for class E housing, are the large proportion of nonwhite persons living in class E housing and the lower socioeconomic status of residents in this class of housing. Possibly, they made less use of hospital facilities.

The rates by manner of injury showed the same general trend as in

other comparisons, except for the categories "hit by person or objects" and "animals." These were considerably higher for class E housing. The category "falls," generally associated with poor housing, also showed a definite rise—from 8.4 per 1,000 for class A housing up to 17.2 per 1,000 for class E housing. This finding is another indication that there is possibly a relationship between housing and incidence of accidents.

### *Effect of Housekeeping*

In another study, a sample survey of home injuries was conducted in Ware County, Ga. Data were collected on nonfatal injuries occurring in the 12 months preceding August 1954 according to: major causes of the injuries, by age, race, and sex; nature and manner of injury; and environmental and human factors associated with the accidents.

To discover if the type of housekeeping influences the home injury rate, the interviewers were asked to observe the condition of the housekeeping both on the inside and the outside of the house and to classify each according to one of five classifications: (1) very well kept, (2) well kept, (3) so-so, (4) carelessly kept, and (5) very carelessly kept. Although the recorded observations were strictly the opinions of the interviewers, the tabulated results did indicate a relationship between condition of housekeeping and home accident incidence.

For estimated major injuries outside the home, the rate per 1,000 population was lowest (26) for premises very well kept and highest (47.7) for premises classified as carelessly kept.

The rates for major injuries occurring inside homes rose in almost a straight line from 28.6 for very well kept homes to 40 for those carelessly kept.

The relationship was similar for minor injuries, although the estimated rates were somewhat higher. The inside and outside rates of 62.3 for homes very well kept rose to 100 for homes very carelessly kept inside and 87.7 for those very carelessly kept outside.

## Aborigine Influence On the Southern Diet

**brief** Diet is an integral part of the culture of any people, and thus in the southern United States the dietary pattern is a part of our cultural heritage.

Generally, the southern diet is characterized by an excess of starchy foods; an ample supply of meat; a near absence of green, leafy vegetables; overcooking of all vegetables; frying in fats; and a general unvarying fare in season and out.

The food list is dominated largely by an Indian heritage. The diet of the indigenous Indians in the 16th century varied locally throughout the south but predominated in meat, corn dishes, beans, and perhaps squash.

The food preparation habits of the southerners are of mixed origin. The southern Indians were boilers and broilers, rarely bakers and never fryers. Long, slow boiling typified the preparation of plant foods other than maize. In fact, most tribes customarily kept a fairly large pot brewing and stewing at all times, and one dipped food from the pot when hungry. Only rarely were green, leafy vegetables used as salads.

On the other hand, frying is common throughout Africa, especially on the Guinea Coast and in the Congo Basin that contributed most of the American Negro slaves. In Colonial and pre-Civil War days, cooking was largely a function of the slave, and it is possible that various frying techniques would thus enter the cooking complex of the southerner. In addition, such cooking would soon attain a cultural value that would make it desirable to those who could not afford slaves.

Also in the Gulf Coast area large populations of West Mediterranean peoples, such as the French and

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Spanish, have introduced many dishes that involve frying in fats and oils. The American Indian had no domesticated animal comparable to the pig in the Mediterranean area and thus had no surplus fats to use as a food preparation agent.

### No "Natural" Diet

There is nothing "natural" about the diet of man, and in the course of his development he has changed from a wholly herbivorous animal to an omnivorous one. He has developed various patterns of food habits that run from extremes of all meat to all vegetable. Like the American Indian, what he eats has been largely dictated by available foods and has often consisted of anything he could obtain. Only incidentally have man's dietary habits coincided with his basic needs.

Diet is often thought to be a matter of conscious selection, although certainly Lewin and Dickins have well supported the contention that "people like what they eat rather than eat what they like." Likewise, people often cannot eat what they do not like, and it is illusionary to think that man rationally selects his likes. The diet of several primitive peoples support this.

For example, nutritionists formerly thought that a balanced diet was virtually essential to existence, yet often Eskimos subsist their entire lives with not one item of vegetable food ever entering their diet. In fact, many Eskimos never eat anything in their lifetime that may be even remotely construed as vegetable food. Occasionally, a lucky hunter may be allowed to eat the stomach contents of a slaughtered whale or seal. In this "stomach spinach," as it has been called, he may get some partially digested vegetables. Certainly, there is nothing to suggest that a craving for vegetable food ever enters his head. On the other hand, it is certainly true that the Eskimo has a rather monotonous diet consisting of frozen fish, seal, walrus, or whale. This is seldom varied, and when something new enters the diet it is meat. It is not surprising that the Eskimo searches through the meat box in the house for a piece

that is somewhat on the "high" side to vary this bland diet.

When an economic status supports the luxury of eating what one likes, man may be fairly selective, but at the subsistence level maintained by most primitives, one eats what is available. Australian natives eat vast quantities of the larvae of a certain moth that they eagerly seek each year. Several California tribes collect and store hundreds of bushels of acorns, and some inhabitants of Nevada and Utah spend nearly all of their waking hours collecting roots and tubers. Their habitat offers little else.

Some Asiatics exist almost wholly on a single plant—rice. In several spectacular instances, men have learned to use plants that are very poisonous in the unprepared state; yet these become a staple food. Manioc, or cassava, is such a plant—the most frequent food used by millions of Amazon peoples. In the fresh state, it is so charged with prussic acid that an unsuspecting bite into a tuber will puff up and blister the whole mouth, and to swallow a small portion usually is fatal.

### Approach to Nutrition

Since diet is part of the culture of a people and one cannot change an aspect of culture very readily, a nutritionist should approach changes in the diet of a locality in a spirit of compromise.

Millions of people in China look upon milk with abhorrence, and most West Africans are horrified at the thought of eating fresh eggs. Many a northern visitor to the south finds eating grits incomprehensible as well as unpalatable, and simple lessons in home economics do not remove these taboos. Man rarely behaves in a rational manner, and the simple truth that one food is better for him than another is hardly sufficient. Deliberate educational approaches, such as inviting people to a prepared feast of nutria dishes, may have only slight success; perhaps nutria gumbo has a chance, whereas baked nutria may not—the former being more closely allied to existing practices.

In the Louisiana State University cafeterias, the nutritionists

are constantly accused by the incoming students of failure to cook the vegetables. Hence, they now cook the vegetables to a cellulose pulp early in the academic year and gradually adjust the cooking time so that by spring the vegetables are properly prepared. This gradualism in vegetable cooking certainly pays bigger dividends than if the student is confronted with strange, but properly cooked, vegetables from the start.

Finally, a wholly humanistic approach is demanded. If the nutritionist presents a too-professional, oversophisticated front, the recipient of the instruction is likely to be repelled. A home economics teacher or a county demonstrator does not have the status that the local physician may have. A physician may accomplish some things simply by prestige. Dickius has shown that most new recipes were introduced to southerners by their friends, and this entree should be exploited by cultural participation on the part of the home economists.

Perhaps an anthropologist, untutored in the culinary skills and lost in the sea of nutritional data, is presumptuous in offering suggestions to the professional food preparer. Nonetheless, this paper is a success if it offers only "food for thought."

## Leptospirosis Diagnosis In North Carolina

**brief** In order to carry out epidemiological investigations of leptospirosis, it is our conviction that the State public health laboratory must provide a reliable diagnostic test for this disease. This

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service was initiated in the North Carolina State Laboratory of Hygiene in January 1954.

The need for the service was brought to a focus in North Carolina in late 1953. At that time, blood specimens were being sent to the Public Health Service Communicable Disease Center in Chamblee, Ga., and reports were often delayed from 1 to 3 months because of the great demand from all sections of the country for the service. For example, the report on a specimen found to be positive in a high titer was not received, it was learned on investigation of the case, until several weeks after the patient had been discharged. The patient had been seriously ill with a jaundicelike disease believed to be infectious hepatitis, although leptospirosis had been considered in the differential diagnosis. A visit to the patient's home after receipt of the laboratory report elicited the information that he had cared for several bird dog puppies when they were ill with leptospirosis.

The response from physicians and veterinarians to the initiation of the diagnostic service has been gratifying, although many physicians do not yet recognize leptospirosis as a disease entity prevalent in North Carolina. The most important reasons for this are: (1) the limitation of instruction on leptospirosis in medical schools to the classical Weil's disease; (2) the widespread publicity given to the viral type of infectious hepatitis; (3) the so-called catarrhal jaundice known for generations to be associated with mild colds and influenza; and (4) inadequate diagnostic service before 1954.

Two points should be kept in mind in dealing with leptospirosis: (1) There are specific laboratory tests for this disease (although a real need for improvement exists), and (2) the reservoir for *Leptospira* organisms is in the lower animal kingdom. Therefore, control of leptospirosis requires the combined efforts of the physician, laboratorian, veterinarian, and health officer. Any member of this team may find the first clue. The others complete and confirm the diagnosis, treat the patient,

and carry out epidemiological studies directed toward finding the source of infection and initiating control measures.

### Diagnostic Tests

The most specific test for leptospirosis is isolation of the organism, but most laboratories are not equipped to carry out this procedure routinely. The detection of specific antibodies in the serum of ill or convalescent patients, however, is a procedure that can be done by public health laboratories. Because the complement fixation test is not yet standardized, the agglutination-lysis test or the agglutination test with killed antigen is used.

For the agglutination test, two specimens of clotted blood, collected about 10 days apart, are required. A rise in titer of agglutinins is considered a reliable basis for a diagnosis of leptospirosis. However, with samples taken late in the disease, when the patient is finally jaundiced or is making a slow recovery from an illness thought to be infectious hepatitis without jaundice, the titer will not rise and may even come down. Since native antibodies do not appear in the normal person, the presence of antibodies indicates present or previous infection with leptospirae.

The difficulties encountered in providing a diagnostic test for leptospirosis make it a task for experienced bacteriologists only. Temperature requirements for growing the organisms are strict. The organisms may disintegrate spontaneously and without warning. Since maximum growth takes place in 5 days, multiple cultures must be maintained if a source of supply for antigens is to be available, the choice of cultures depending on the types of infection in the locality. Antigens must be prepared regularly, and the tests must be carefully controlled to insure good results.

### Examples of Cases Diagnosed

A high percentage of the human and animal serum specimens examined in North Carolina since January 1954 were positive. Many specimens

were positive with more than one strain of *Leptospira*, indicating cross-agglutination between strains. A few examples follow:

Specimens from several herds of cattle which were experiencing breeding difficulties, including abortion, and which were negative to *Brucella* tests were positive in high titers to *Leptospira pomona*.

A few mule blood specimens have been found positive to *Lept. pomona*. One specimen that reacted in a very high titer was taken from a mule suffering from periodic iridocyclitis, a condition recently recognized as a delayed and uncommon sequela of leptospiral infection in men and horses.

Among the specimens from humans was one which showed a titer of 1:2,048 for *Lept. pomona*. It was taken from an 8-year-old Negro boy with an illness diagnosed by his family physician as leptospirosis. An epidemiological investigation revealed that the boy had had no contact with animals suspected of having the disease. However, a goat was kept on the farm premises where the boy lived, and rats were prevalent. Drinking water was obtained from a shallow well that could easily be contaminated with goat urine. A blood specimen from the goat showed a titer of 1:2,560 for *Lept. pomona*. Later, the goat was killed and *Lept. pomona* organisms were isolated.

## Rabies Control Plan For South Carolina

**brief** In September 1950, a statewide survey was made in South Carolina in an attempt to determine the extent of rabies within the State. Between September 1950

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and March 1951, after numerous consultations with veterinarians, county health officers, and county health sanitarians, the South Carolina State Board of Health drew up a master rabies control plan.

The first step in the plan was a statewide publicity campaign, which was conducted for 30 days prior to a designated period of animal vaccination and stray dog control. The radio, daily and weekly news releases, and pamphlets distributed through schools, churches, and civic organizations were used in the campaign.

The second step was the operation of vaccination clinics for a 6-day period, in April 1951. The clinics, a total of 1,042 of them, were manned by county health department personnel and members of civic groups, the boy and girl scouts, and similar organizations. Practicing veterinarians performed the vaccinations. Vaccine and tags were furnished by the local veterinarians, who collected \$1.00 per animal. State rabies certificates were furnished each veterinarian by the State board of health. During this period, 57,739 dogs were vaccinated.

The third step was a followup publicity campaign to further educate the public regarding rabies and its control. Stray dog control and the reporting of rabies cases were stressed. The public was kept rabies conscious throughout the year and was continually requested to take pets to the local veterinarian for vaccination.

The rabies control plan, with a few minor changes, was carried out again in 1952, 1953, and 1954. The results of the program from 1950

through 1954, are shown in the accompanying table.

### Morbidity Reporting

In August 1951, a morbidity reporting system for rabies was initiated by the State board of health, the reports originating with the practicing veterinarians and routed direct to the vital statistics section of the State board of health. The percentages of cards returned were as follows: 1951, 98.7 percent; 1952, 83 percent; 1953, 78.3 percent; 1954, 67.4 percent.

In 1953, the State board of health received complete investigation reports on 631 persons who were given rabies treatment. Of the 373 animals involved, 319 of them were dogs, showing definitely that dogs constitute the major rabies problem as far as human beings are concerned. Of the 631 persons, 539 were white and 37 were Negro, a finding which suggests that Negroes in the State do not report possible exposure to rabies unless the exposure is a severe bite.

The investigation reports revealed, further, that puncture wounds caused by teeth was the method of exposure for 281 of the persons treated. Wounds caused by scratches was reported for 125; and handling of animals, for 162. For 56 of the persons treated, there was no exposure, and for 7 the method of exposure was not stated. From these data, it would seem that 350 persons were treated for rabies when exposure to the disease was doubtful. We believe that a more extensive history of the case should be obtained before humans are given rabies treatment.

## Matched Data on Births And Neonatal Deaths

*brief*

With the introduction of the birth weight item on the birth certificates of all but one State by 1950, it became possible to obtain much needed information on the incidence of prematurity and mortality among prematures for the general birth population. Data on incidence of births by weight are now being tabulated regularly by the National Office of Vital Statistics and by many States. A special NOVS study covering births in the first 3 months of 1950 will provide detailed national and regional data on mortality by birth weight. The NOVS can make studies of this type only occasionally and will require the assistance of the States in the matching phase of the operation.

Many States match births and infant deaths routinely, and data on mortality by weight can be obtained as a byproduct. Information for individual States is of interest to many people because public health programs for the special care of prematurely born infants are now operating in several States. To make State data available in one source, the Public Health Conference on Records and Statistics—a permanent organization providing for coordination among Federal, State, and city registration executives and vital statisticians—sponsored a cooperative program to send data on matched births and neonatal deaths to the NOVS for processing and publication. This program was initiated with the collection of data for 1950.

Specifications for the tabulations to be collected from the States were worked out jointly by the NOVS and the States through the mechanism of the conference. Table forms prepared by the national office are sent to the participating States. In the

**Rabies control data for South Carolina, 1950-54**

Year	Vaccinated, all species	Clinical cases	Positive heads	Human treatments
1950.....	55,629	885	324	3,362
1951.....	126,447	686	350	2,973
1952.....	108,939	372	298	2,213
1953.....	100,622	279	246	1,946
1954.....	98,418	188	293	1,917

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first 2 years of the program detailed data were collected on birth weight by race, sex, attendant at birth, period of gestation, plurality of birth, cause of death, and age at death. At the last conference meeting, it was agreed to continue collecting data on an annual basis but to schedule detailed tabulations only yearly. Thus, for 1952-54 the data have been or will be requested by race, period of gestation, and birth weight; for 1955-57, it is planned again to obtain tabulations by cause of death and age at death.

Participation in the program has increased markedly. In 1950, 11 areas (including 1 city and a Territory) and in 1951, 19 areas (including 2 cities, 1 Territory, 1 possession) submitted tabulations; and about 25 areas are expected to participate in 1952 and 1953 (see table).

In formulating the program, only general principles for tabulating the data were set down. These principles were:

1. Neonatal death records included in the tabulations for an area should relate to all infants born in that area.

2. Tabulations on neonatal deaths prepared on the basis of year of birth are preferable to those based on year of death. However, this is not an important issue and tabulations prepared on either basis should be accepted.

3. Unmatched neonatal deaths should be tabulated along with matched neonatal deaths.

Answers to inquiries on the data submitted for 1950 and 1951 indicated in what ways the States departed from these principles. The only significant difference was the omission of unmatched neonatal deaths.

Information was not requested of the States on other procedures related to the coding and tabulating of the data. The consequent inability to evaluate the comparability of the data creates one of the main problems in the use of pretabulated data. In 1950 and 1951, birth data tabulated by the NOVS were used in conjunction with mortality data prepared in the States for computing mortality rates. The decision not to request the birth data from the

## Participants in the collection of data on matched births and neonatal deaths

Area	1950	1951	Tentative	
			1952	1953
Total.....	11	19	24	28
Arkansas.....			X	X
Connecticut.....		X	X	X
Delaware.....	X			
Florida.....		X		X
Georgia.....			X	X
Illinois.....	X	X	X	X
Iowa.....			X	X
Kansas.....				X
Kentucky.....	X	X	X	X
Maryland.....			X	X
Michigan.....		X		X
Minnesota.....		X	X	X
Mississippi.....	X	X	X	
Montana.....			X	X
New Hampshire.....	X	X	X	X
New Mexico.....	X		X	X
New York State (excl. New York City).....	X	X	X	X
North Carolina.....			X	X
Ohio.....		X		
Oklahoma.....		X		
Oregon.....		X	X	X
Rhode Island.....			X	X
Tennessee.....	X	X	X	X
Utah.....			X	X
Vermont.....		X		X
Virginia.....				X
Wisconsin.....	X	X	X	X
Baltimore.....	X	X	X	X
New York City.....		X	X	X
Alaska.....			X	X
Hawaii.....	X	X	X	X
Virgin Islands.....		X	X	X

States in these years was made in the belief that the burden of tabulating might act as a deterrent to the participation of some States. Experience with the use of data from the States and the NOVS for 1950 showed inconsistencies in the coding of certain items. Another problem which arose in 1951 was related to the 50-percent sampling of birth data for that year. This was of significance at the very low weights. Beginning with 1952, the States have been requested to supply birth data if available, as well as mortality data. Most States have indicated this could be done.

A report on data collected for 1950 and 1951 will be published later this

year. This report will contain birth weight statistics for births by race, sex, and plurality and for neonatal deaths by race, sex, cause of death, and age at death. Data on a few additional items on which statistics were collected were not included because of the apparent lack of comparability of the birth and death data for some areas. Subsidiary information for each area on completeness of birth registration and mortality based on data tabulated wholly by the NOVS is to be shown. Because of the biases in the reporting of weight for very small infants who die soon after birth, special procedures, utilizing available data on gestation age, were set up for the



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## Progress in Prevention Of Diarrheal Diseases

**brief** Although acute diarrheal diseases have been brought under control in the United States, Canada, and a limited number of other economically favored countries, available mortality data

should be available for each State, on weight-specific mortality. Data studies to make available statistics NOVOS hopes to carry out special ture—perhaps every 5 years—the At regular intervals in the fu

eny in their data. of the assurance of greater consist- participation of these States because be of especial value to obtain the velopment of the program, it would neonatal deaths. In the future de- supply data on matched births and card program have not been able to now, some of the States in the punch- good comparability. However, until these States should generally have birth weight data received from punchcard program. Pretabulated States are now participating in the cards, the consistency of these data and sample verification of the punch- tificates received from these States statistics. Through copies of birth cer- been invited principally to birth sta- This method of collecting data has cards used in national tabulations, furnishing the NOVOS with punch- Under this program, States are now for the collection of pretabulated data on matched births and deaths. few years ago has some significance The punchcard program started a shown in the report.

area. Only these adjusted data are with weight not reported for each distribution of births and deaths

The role of viruses has not been established. The important role of predispensing causes, and particularly of deficiencies in nutrition, is generally acknowledged even though the

tance as a leading cause of death. ability of limited quantitative impor- types of *Escherichia coli* are prob- as *Enteramoeba histolytica* and specific Other infectious agents such as and humans live in close prox- leant in some rural areas where ani- isms have been reported to be preva- the infections caused by these organ- are of lesser importance, though- major etiological agents. Salmonel- enteric infections. Shigellae are the- faunts and children are chiefly specific the serious diarrheal diseases of in- . Data now available indicate that the control of diarrheal diseases.

breeding presumably contributed to ination of this prolific source of dy- stables in urban centers and the elim- ample, with the disappearance of duction of the motor car, for ex- public health activities. The intro- development, as much as by direct by community, social and industrial

These changes were brought about the home. improvement of infant hygiene in ness, the control of flies, and marked- human feces, better personal cleanli- tance were the safer disposal of involved. Perhaps of chief impor- Multiple factors apparently were eradicated by an intensive program. There was no biologic vector to be was no vaccine, no new medication. fecive in the United States. There what preventive measures were ef-

Multiple Factors in Prevention

There is no clear evidence as to what preventive measures were ef- fecive in the United States. There was no vaccine, no new medication. eradicated by an intensive program. Multiple factors apparently were involved. Perhaps of chief impor- tance were the safer disposal of human feces, better personal cleanliness, the control of flies, and marked improvement of infant hygiene in the home.

It is of historic significance that these diseases are at last to receive concentrated special attention from organized international public health. Within one decade there may be attained in the countries of the Americas that progress in the control of diarrheal diseases which in the United States came slowly over a period of 50 years.

The chief responsibility for the prevention of diarrheal diseases must rest with organized public health. There is the evidence of history that the severe diarrheal diseases are almost totally prevent- able. There is no single point of attack. For their prevention, mul-

### International Focus

ment is begun without delay. of diarrheal disease provided treat- successful therapeutic management of a very high percentage of all cases treatment provide a means for the salmoneiosis. These advances in cific therapy has little or no value in effective in shigellois although spe- biotics have been found to be rapidly sulfonamides and many of the anti- In antibacterial treatment, the successful.

Therapeutic knowledge is now adequate for the prevention of deaths in almost all cases of diarrheal dis- ease. Regardless of etiology, prompt and adequate fluid and electrolyte replacement therapy commonly is successful.

Present techniques have markedly increased the sensitivity of bacteri- ological tests for shigella and sal- monella and have made it practicable to handle relatively large numbers of these diagnostic examinations. Bacteriological tests on representa- tive samples of the normal popula- tion have established the common occurrence of carriers of shigella. They have served also to reveal the broad range of clinical manifesta- tions of shigellois and the frequent occurrence of clinically mild cases in adults. These observations must be considered in planning for effective control.

### New Advances in Control

diarrhea have not been fully defined. Epidemiological studies have led to the conclusion that the dissemination of shigellois commonly involves a more or less direct transfer from one person to another of human feces containing shigella, and the role of flies in this transfer has been securely established. In salmonellosis most of the infections have their origin in lower animals and fowl, and dissemination occurs predomi- nantly through the medium of foods.

tiple procedures are indicated, and a well-balanced program is necessary.

The nature of the problem must be accurately diagnosed—this requires the participation of the public health laboratory, epidemiology, and vital statistics.

Environmental preventive measures must be applied through programs of community sanitation, with emphasis on the availability of water, the safe disposal of human feces, garbage disposal, and fly control—this calls for the services of sanitary engineers and sanitarians.

Knowledge must also be applied directly to individuals—this is the responsibility of public health physicians, public health nurses, and health educators.

All these broad control measures must be organized and coordinated by the public health administrator. These goals will not be attained easily, but it has been adequately established that difficult public health programs can be carried out when they are given due emphasis.

Heretofore, major attention by international health agencies has been directed toward such diseases as yellow fever, malaria, typhus, and yaws, and only scant attention has been given to the diarrheal diseases, recognized as an even greater cause of death than malaria, for instance.

In view of this history the recent activities of the 14th Pan American Sanitary Conference at Santiago in October 1954 are highly significant. During 5 half-day sessions representatives from all of the countries of the Americas considered together problems in the control of the diarrheal diseases. By resolution the Pan American Sanitary Bureau was requested to implement the technical recommendations which grew out of the technical discussions.

From that point the matter is being carried forward by critical planning. A series of international regional seminars will give attention to the newer scientific advances in the knowledge of the diarrheal diseases. A demonstration area to apply and evaluate a broad preventive program is deemed essential. As an immediate life-saving program, the easily applicable measures to

prevent dehydration and resulting death will be promoted widely.

The effectiveness of these and other procedures can be measured only by time, but it may be anticipated that there will be an increased emphasis on the control of diarrheal diseases at national and local levels in our sister countries.

## Prematurity Program In North Carolina

*brief* Premature birth is the greatest single factor associated with the deaths of infants in North Carolina as well as in the United States.

The reduction of infant deaths in the first 28 days of life has not kept pace with the decline in mortality in the later infancy period, 1 month to 1 year. Approximately 60 percent of the infants who die in the first month are premature—that is, they weigh  $5\frac{1}{2}$  pounds (2,500 grams) or less at birth.

If progress in the lowering of infant mortality is to continue, steps must be taken to reduce the number of deaths among prematurely born infants. To this end, a premature infant care program was established in North Carolina in July 1948. The program, sponsored by the North Carolina State Board of Health, the North Carolina Pediatric Society, and the Children's Bureau, is designed to reduce the infant mortality rate in the State through:

1. Prevention of premature labor by the methods known to prolong gestation.
2. Care of the premature infant by lessening risk of delivery, early case finding, hospitalization in approved centers, and followup.
3. Education of nurses, physicians,

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and the laity in the care of premature infants.

In 1952 a special report form was initiated for collecting detailed information on each premature infant born in the six participating hospitals or referred to them for care. This form calls for information on prenatal care of the mother, previous pregnancies, complications of pregnancy, type of delivery, and use of anesthesia and analgesia. Information on treatment and progress is requested for infants whose care is paid for by the State.

These records, along with consolidated birth and matching mortality data kept since 1952 on a statewide basis supplied the information for analyzing the effect of the program.

During the study period 1952-53, there were 16,378 single premature births in North Carolina; 1,307 of these births occurring in the six participating hospitals are compared with the 15,071 births in other places.

Analysis showed that a significantly larger proportion of the premature infants in the lower weight groups, 2,000 grams or less, were born in the premature centers—38 percent compared with 31 percent.

The greatest weight difference was found for nonwhite infants in the previsible group of under 1,000 grams. The percentage of babies (9.1) in this group in the premature centers was almost twice the corresponding percentage (4.6) for all other nonwhite prematures.

Because of a higher proportion of early premature babies and the referral of obstetric problem cases, the centers had a higher neonatal mortality rate—156.8 per 1,000 live births compared with 146.7 for all other prematures. Actually, with the exception of the lowest weight group, the weight-specific mortality rates in the premature centers were much lower than for other premature births.

Immaturity, unqualified or subsidiary to other conditions, was the most important cause of death for both groups of prematures—80.3 per 1,000 live births in the centers compared with 71.3 for all other births. For nonwhite births the difference



<sup>1</sup> Rate per 1,000 live births.

[illegible]

Single premature live births and neonatal deaths according to birth weight, North Carolina (exclusive of premature centers) and premature centers, 1952 and 1953

care.  
The type of delivery—normal, abnormal, instrument, cesarean, and

survival of the premature infant. Type of care received by the mother was reported for all but 10 of the 1,307 premature births in the hospitals. Of these 22.4 percent received clinic care, 65.3 percent private care, and only 2.3 percent no

### *Maternal factors*

## Maternal Factors

was more striking—105.3 per 1,000 live births in the centers compared to 75.1 for all other nonwhite prenatals. These differences in mortality rate might be accounted for again by the difference in the weight distribution. With a large proportion of early prematures in the centers one might expect a larger proportion of deaths due to immaturity. Death rates due to asphyxia and atelectasis for white babies and birth injury for nonwhite babies were considerably higher among premature center births.

major anæsthesia. In comparing the causes of death and various types of anæsthesia, it was found that for deaths due to asphyxia and atelec-

other specified analgesia. It is known that both an analgesic and an anesthetic were given for 60.5 percent of the deliveries. In 63.4 percent of these cases a general anesthetic was given, and demonstrated the most frequently used com-

Analgesics used were classified according to three types: general, local, and spinal or caudal. The analgesics administered were barbiturates, demerol, scopolamine, or

high forceps. Mortality rates were highest for babies with an abnormal presentation delivered and those delivered cesarean section—33.3 per 1,000 live births for abnormal and 24.6 for cesarean. However, each of these rates is based on less than 100 cases.

unknown—was stated for all but three births. For 66 percent of these the delivery was normal, pre-sumably without operative interference. Another 21.1 percent were delivered by instrument—low, mid, or

The mortality rate for this group was 195.6 per 1,000 live births while that for babies born to mothers without complications was 128.1. The difference between these two rates is statistically significant. Deliveries

Of the 1,307 premature infants at percent were born to mothers with complications of pregnancy. Also 52 percent of the 205 neonatal deaths occurred among the births to moth-

*Complications Affect Survival*

As the mortality rates were highest for births in which either caudal or general anesthesia was used at delivery. Among deaths due to immaturity, the group of births experiencing the highest mortality rate had been administered no anesthesia. The rate for this group was 278.1 per 1,000 live births.

complicated by hemorrhage exhibited the highest mortality rate.

Infants born to mothers with complications comprise about 60 percent of the weight group of 2,000 grams or less. In the lowest weight group, under 1,000 grams, 63 percent of the births were to mothers with complications. The risk of a previable or early premature baby was greatest for the mother with a complicated pregnancy.

Further study will be necessary to determine the relationship of certain maternal factors to prematurity and survival. Data presently available are insufficient for any definite conclusions to be drawn, and 1954 and then 1955 data will offer additional evidence. However, we are confident that many premature babies that would have died have been saved as a result of this program.

## Congenital Disorders— A Problem for Research

**brief** Events of the past two decades present public health statisticians with an opportunity to help solve the problems of congenital malformation, cerebral palsy, epilepsy, and mental deficiency. These disorders have perplexed both professional and lay thinkers throughout the period of recorded medical history.

The occurrence of malformation at birth has commonly been thought to be the result of some defect in the germ plasma and thus hereditary. Recent clinical observations and experimental demonstration in animals indicate, however, that the hereditary hypothesis is not a sufficient explanation of these disorders, and the concept of environmental determination has evolved. If proved true as a general mechanism, this

concept provides great hope for the prevention of these tragic abnormalities.

There is a pressing need for extensive statistical research to examine a set of hypotheses which are consistent with the concept of environmental determination. Since the public health statistician already has, by his custody of vital records, possession of much of the information required for this task, he stands in a particularly fortunate position to produce useful information.

### *Hypotheses To Be Tested*

The principal questions that need clarification are:

1. Does the presence of infection during pregnancy affect the risk of congenital anomaly? Two further questions apply here: (a) Do all diseases exhibit teratogenic properties or only specified types? (b) Is the time of onset a determinant of the teratogenic potential of a disease?

2. Does the presence of noninfectious disease—toxemia, hypertension, anemia, diabetes—affect the risk of congenital anomaly? (Questions 1-a and 1-b also apply here.)

3. Does the presence of nonspecific insults—vaginal bleeding, accidental injury to mother, dystocia, malpresentation—affect the risk of congenital anomaly? (Question 1-b, when applicable.)

4. Do cultural and socioeconomic variables directly affect the risk of congenital anomaly?

5. Is the increased risk of mongolism and gross malformation in babies born to older mothers independent of cause-effect mechanisms under investigation as outlined in questions 1, 2, and 3?

### *Information Required*

The basic data required to compose a meaningful and useful body of knowledge on congenital disorders may be listed as follows:

1. Frequency of malformation, total and by type, among stillbirths and live births.

2. Time trends in the incidence data, by year and by season.

3. Geographic variation in incidence by type of malformation.

4. Variation in incidence by socioeconomic status, age of parents, and birth order.

5. Presence of infectious disease, by type and by date of onset during pregnancy for each live birth and each stillbirth.

6. Presence of specified complications of pregnancy for each live birth and each stillbirth, with specific reference to anemia, hemorrhage, and toxemia.

7. Presence of specified complications of labor for each live birth and each stillbirth with specific reference to malpresentation, placental abnormality, and dystocia.

8. Presence of symptoms of respiratory difficulty in the infant at birth.

### *Sources of Data*

The public health statistician has an instrument in the form of vital records which is clearly without equal for establishing the characteristics of the study universe. There is little question that birth records can provide useful working information on distribution of infants at risk according to area of residence, season of gestation, weight at birth, age of mother and of father, birth order, and, by deduction, occupation of father, residence of parents, and socioeconomic status.

A number of health departments have attempted to secure significant elements of the prenatal history, including labor, and an indication of the presence or absence of congenital malformation and birth injury by the use of a medical supplement to the birth certificate. Experience with this procedure appears to be fairly uniform. In areas in which hospital births approximate 95 percent of the birth experience, gross understatement of complications of pregnancy and labor has been noted when the findings are compared with data as found in the hospital history.

In my experience, I have found no insurmountable difficulties to securing accurate and complete data on specified segments of the prenatal and labor history of the mother and on the physical state of the newly born infant. The medical supplement to the birth record is a useful instrument for obtaining the birth

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complicated by hemorrhage exhibited the highest mortality rate.

Infants born to mothers with complications comprise about 60 percent of the weight group of 2,000 grams or less. In the lowest weight group, under 1,000 grams, 63 percent of the births were to mothers with complications. The risk of a previable or early premature baby was greatest for the mother with a complicated pregnancy.

Further study will be necessary to determine the relationship of certain maternal factors to prematurity and survival. Data presently available are insufficient for any definite conclusions to be drawn, and 1954 and then 1955 data will offer additional evidence. However, we are confident that many premature babies that would have died have been saved as a result of this program.

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weight and information on operative procedures and complications of labor, but recourse to additional sources is necessary for a more complete measurement of several of the variables to be considered. For example, malformations often are not discovered until after the birth record is filed. When these conditions result in death, they will be noted on the death record, which can be matched with the appropriate birth record. Also, the public health nurse's visit to the home of the infant a few weeks after birth can be made the occasion of an examination for malformation and a report thereof. Another source is the program for crippled children.

The recorded birth universe is also an excellent source for the selection of a control population. In a study of the relationship of prenatal and paranatal factors and the development of epilepsy, for example, Lilienfeld and Pasamanik secured their case population from the available clinic registers and known institutionalized patients. For each case, they selected as a control the next infant in the birth register born in the same institution and matched for race and maternal age. They abstracted the hospital records for both series for certain variables of interest and compared the two groups.

These two methods—the use of the medical supplement to the birth record and the matched control hospital record survey—for obtaining data on factors associated with congenital disorders both involve to some extent a retroactive type of investigation. Essentially, at birth or following birth, an attempt is made to record the prenatal history of the infant or child. There are two serious limitations to this approach. If one is concerned with a known case of malformation, there is some tendency to search in the prenatal record or to query the mother about prenatal events with more care than in a case where no malformation is present, thus producing a bias that makes it impossible to construct any useful inferences. The second difficulty arises out of the fact that the records may not uniformly contain the detail required when we set about to an-

swer questions based on past experience.

### *A Course of Action*

Assuming that research in congenitally determined disorders suggests itself as worthy of statistical research by a health department, what is a practical course of action?

First, the birth record, including the fetal death record, should be used to describe the population at risk, the distribution characteristics of prematurity, and, to the extent that local conditions permit, the incidence of complications of pregnancy and labor. To obtain uniform coverage of prenatal history, summary sheets for inclusion in the hospital record can be provided.

Second, the birth record plus the fetal death record, the death record, and data on malformations from public health nurses, well baby clinics, and crippled children services should be used as a basis for estimating the incidence of congenital malformations and some of their distribution characteristics.

There are, no doubt, areas where the procedures given above will require years of nurture before data of value can be produced. It may be that, as a universal system is being developed, it would be desirable to construct a study area within a given jurisdiction consisting of the prenatal clinics administered by the local health departments, the teaching hospitals, and such other large obstetrical services willing and capable of participating in longitudinal studies. Each birth within the study area would be reported by the usual live birth certificate or fetal death record supplemented by a record of the prenatal life, the labor history, and a statement based upon an examination of the newborn for evidence of malformation. The public health statistical unit should be prepared to provide consultation on the study design and assistance in collection and interpretation of data.

At present, the most practical method for probing into the prenatal determinants of cerebral palsy, epilepsy, and mental deficiency remains the retroactive study, for these conditions are rarely apparent

at birth. But this type of study would nevertheless benefit from the proposed universal collection scheme. The population as a whole would be described and known. The cases under study could be matched back to the appropriate birth record, and their characteristics thereby established.

## **Integrated Rehabilitation Of Cleft Palate Patients**

**brief** Because of the variety of problems presented by the person with a cleft palate, no one specialty can attempt to deal with them all. A cleft palate is not just a "hole in the head" to be closed up in any fashion, or just a speech defect, or just a malocclusion. All of these conditions, along with the emotional and intellectual aspects, are related and interdependent. Hence, the team approach is gaining wide acceptance as the most productive way of rehabilitating these patients.

The essential services in rehabilitating the cleft palate patient are pediatrics, surgery, dentistry, orthodontia, prosthodontia, speech therapy, otolaryngology, psychology, and social service. Other services are added as the need arises. Each member of the team has a particular responsibility, but all members must work together for maximum effectiveness.

### *Pediatrics, Surgery*

The pediatrician is in a position to guide the parents as soon as the baby is born. The manner in which he handles their attitudes and reactions toward the condition is all-important in the later adjustment of the parents to the child and, consequently, in the adjustment of the child himself to the handicap.

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*By Jeanette Lagauite, Ph.D., assistant professor of speech pathology, Tulane University School of Medicine.*

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The pediatrician can steer the parents' thinking toward the positive aspects of what can be done, rather than letting them dwell on the negative questions of what has not been done. He can reassure them that the baby can be provided with a cosmetically normal facial structure and with adequate oral structures for speech and nutrition.

It is the responsibility of the pediatrician, therefore, to acquaint the parents with a cleft palate team or with whatever agencies or resources are available in the community for cleft palate rehabilitation.

There is not much controversy concerning the surgical closure of the cleft lip. This procedure is usually carried out as soon as the baby is judged strong enough, usually about the third or fourth month.

Surgery on the palate, however, is another question, one that can best be answered through the team approach. The traditional treatment of cleft palate was by surgery. However, because surgery has so often been unsuccessful, many workers have felt that a reevaluation of surgical procedures, and especially of the timing of surgery, should be undertaken.

With the help of the orthodontist, prosthodontist, and speech therapist, the surgeon can better decide how and when to operate. The following criteria are now being used to judge whether or not a palate should be closed surgically and, if so, at what age:

1. Adequacy and vitality of tissue.
2. Spatial configuration of anatomic segments of the cleft, that is, width and shape of the cleft.
3. The relationship of the palate to contiguous anatomic structure in the pharynx.

### *Dentistry*

Good general dental care is even more important for the cleft palate patient than for the average person. The successful use of a prosthetic device often depends upon the amount of retention which can be provided. Teeth should be cared for so that they do not become carious nor the gums diseased.

The influence of the deciduous teeth on the eruption of the permanent teeth and the consequent development of facial structures cannot be overemphasized. There is a direct relationship between the size and shape of the dental arch and the health of the baby teeth. Good habits of oral hygiene are a necessity for the cleft palate patient and must be instilled early and followed faithfully.

Through orthodontia, it is possible to restore teeth to their proper positions and to maintain them in their correct relationships. The orthodontist must have a thorough knowledge of growth factors and must know when to use appliances and what types to use to achieve the maximal results in alignment of structures. He aids the surgeon or prosthodontist by retaining the parts in the desired position or by repositioning structures so that they can work more effectively.

Prosthesis and speech appliances were formerly viewed as a last resort, after surgical failure. Subsequently, some workers developed the philosophy that prosthesis was the method of choice and that surgery should never be used.

It is now generally accepted that surgery and prosthesis offer complementary procedures for the rehabilitation of the cleft palate patient. When tissue is inadequate and a poor surgical result is almost a certainty, an appliance may be indicated from the beginning. Sometimes the surgeon can repair the hard palate but is unable to construct a functional soft palate. Then a speech appliance can be used to improve articulation. Young children may be fitted with a training appliance until they have reached the optimal age for surgery.

### *Speech Therapy, Otolaryngology*

Among the several duties of the speech therapist, the most obvious one is the evaluation of the speech. In some patients, defective speech is due to causes other than the cleft, and the therapist must be able to differentiate these cases.

The therapist then must evaluate the structures in the light of the speech. Is the velo-pharyngeal clo-

sure adequate? Are there barriers to good tongue movement, such as orthodontic appliances? All these points must be assessed so that the advisability of further surgery, further orthodontia, or other procedures may be decided upon.

With a child who has not yet begun to talk, the speech therapist assumes the role of counselor to the parents. Ways in which to foster normal speech development and behavior to be avoided are discussed. As the child begins to talk, the parents are given specific suggestions for working with him at home until formal speech therapy is indicated.

Children with cleft palates are more susceptible to respiratory infections and more often have ear infections and accompanying hearing loss than normal children. They need careful periodic checkups to reduce the incidence of middle ear pathology.

Since much middle ear involvement is caused by blockage of the eustachian tube with hypertrophied lymphoid tissue, the otolaryngologist is faced with a problem in advising tonsillectomy and adenoidectomy. Often, the velo-pharyngeal closure which provides adequate speech is achieved because the palate rests against a large pad of adenoid tissue on the back wall of the pharynx. Removal of this adenoid pad may cause serious consequences speechwise. The otolaryngologist must decide whether an operation is indicated, how much tissue to remove, and the possible consequences to speech.

### *Social Service, Psychology*

The social worker serves as a liaison between the team and the patient or his family. He interprets to the patient the decisions as to type of treatment, steps in the program, and the like. Also, he can help the team to plan by informing them of the attitudes and feelings of the family and the ability of the patient to cooperate and carry out recommended procedures.

In a total rehabilitation program, the mental and emotional factors are of vital importance. It is necessary to know the capacities of the patient so that a realistic policy can be pursued. Sometimes a patient, because

of intellectual capacity or economic, social, or emotional influences, is incapable of sufficient cooperation to make a prosthetic device practical. Therefore, surgery may be a better choice for him, although it is not the better one structurally.

The psychologist can be of value not only in testing, but in counseling and guiding both the patient and his family. A realistic, objective attitude to the handicap, an acceptance of the limitations of therapy, and a healthy emotional atmosphere can be as helpful as good surgery or a perfect appliance.

## Excess Water in Milk— Georgia's Experience

**brief** A program for the detection and control of excess water in milk through the systematic use of the refractometer and cryoscope in Georgia has resulted in a marked decrease in the number of samples containing excess water. During the first year of the program, 1950, over 32 percent of the 2,623 milk samples examined showed excess water as compared to only 3.3 percent of the 16,176 samples examined during 1954. The results suggest that other States might find more water in their milk supplies if greater emphasis were given to this important examination.

Important in the success of the program was the excellent cooperation between State and local health department personnel in their work with milk plant operators and dairy farmers. Authority for milk control is not vested in the Georgia Department

of Public Health. This department acts only in an advisory capacity to local health departments. The local departments have adequate authority to enforce regulations adopted by their boards of health. However, it is to the Georgia Department of Public Health that local health departments turn for assistance, advice, and guidance on milk sanitation, and for laboratory services.

The State laboratories first offered laboratory services for the examination of milk and dairy products during the latter part of 1948. From the beginning, a sufficient number of low lactometer readings were obtained to indicate the need for a thorough investigation of excess water in milk. Consequently, when the central laboratory milk unit began operating in April 1950, the detection of excess water was emphasized. The findings indicated that either adulteration or gross carelessness, or both, was a common practice.

In July 1950, the central laboratory instituted the cryoscopic method of determining excess water in milk as a routine laboratory procedure. The results obtained aroused widespread interest throughout the State and accelerated the demand for this service.

### Methods

At the beginning of the program, the equipment and procedure outlined in Standard Methods for the Examination of Dairy Products was closely followed. This involved the use of the Hortvet cryoscope or its equivalent. It soon became apparent that the freezing of all samples with the cryoscope would be too time consuming for routine application. The other official procedures outlined were then investigated. From these, a modified sour serum method was developed for screening all samples for possible adulteration with water.

A Bausch and Lomb juice refractometer was selected as the instrument for this screening job. With it, the percentage of dissolved serum solids could be read after filtering a small amount of milk which had been rapidly soured by adding 25 percent acetic acid and subsequently heating

in a 70° C. water bath to speed the separation of milk curd and serum.

In 1952, Vandiviere, Brooks, and Sunkes reported a comparison of results obtained in a parallel study of 2,898 milk samples examined with both cryoscope and refractometer. This data indicated that a screening point of 7.55 percent dissolved serum solids, or greater, by the Bausch and Lomb refractometer reading, could be used to eliminate a large number of samples from cryoscopic examination.

It was then policy to report excess water in all samples in which the cryoscope indicated 3 percent or more excess water. This tolerance of 3 percent is allowed in the official procedures. Later, the policy was altered to allow for an operational error in addition to the 3 percent allowed for variation in the freezing point of normal milk.

Data on 7,115 milk samples examined during November 1951 through December 1952 revealed a definite break in the percentage of positive samples observed to lie between the refractometer readings of 7.40 and 7.35. Of the 1,623 samples with refractometer readings of 7.40 or higher, only 71, 0.9 percent of all samples, showed reportable excess water of 5 percent or greater when examined on the cryoscope, and only 23 had greater than 6 percent. Hence, most of these 71 samples were borderline cases considered to be of little significance.

The screening point for milk to be reported as "free of excess water" was set at 7.40. All samples showing a lower percentage of dissolved serum solids were then subjected to cryoscopic examination. Excess water is reported only when the cryoscope examination shows 5 percent or more present and is reported to the nearest 0.5 percent.

### Evaluation Control

From the beginning, a monthly evaluation of the procedure has been maintained. The evaluation samples involve the use of a herd sample milked under the surveillance of a health department official. Milking machines and other containers are inspected to see that no excess

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water gains entrance to the milk. Known amounts of water are then added to portions of this milk and samples in ice cases are shipped to reach the regional laboratory on the following day.

The evaluation samples are examined by all cryoscope operators routinely making examinations. The central laboratory, which acts as a control, performs its tests on the same day as the regional laboratories. By means of this evaluation program, the work done in the central laboratory and three regional laboratories is closely coordinated, and any need for restandardization of freezing-point thermometers is promptly indicated.

### *Education*

Much of the success of this program can be attributed to the educational approach of the sanitarians in dealing with those in whose milk excess water has been found. Only in a few instances, where there was no response or indication of cooperation in keeping excess water out of the milk, have local health departments had to revoke the permits of offending dairymen.

Whenever excess water is found in milk, the laboratory report is accompanied with a slip of paper on which it is pointed out that "it is believed that in the majority of cases an excess of water is due to the lack of knowledge of the condition rather than willful adulteration on the part of the dairymen." Then, the following list gives possible causes of excess water in milk:

1. Utensils not thoroughly drained before use.
2. Leaking cooling boards which allow the cooling water to enter the milk when it is flowing over the board.
3. The use of leaking milk cans which, submerged in water, allow the water to enter the milk.
4. Haste to cool milk by placing ice directly in the milk.
5. The addition of water to milk by employees in an effort to impress the owner of the dairy with their ability to maintain or increase the volume of milk production.

### *Results*

During the 5 years of the program, the incidence of watered milk has sharply dropped. During 1950, the first year of the program, 2,623 milk samples were examined with the cryoscope. Of these, 846, or 32.3 percent, contained excess water. However, since many of these examinations were made on repeat samples in which excess water was suspected, this did not mean that 32 percent of the milk being sold on the Georgia market was watered.

During 1951, 9,074 samples were screened with the Bausch and Lomb juice refractometer; 3,823 of these, plus 831 others, were examined with the cryoscope. Of the 9,905 samples submitted to screening or direct cryoscopic examination, 1,264, 12.8 percent, were found to contain 3 percent or greater excess water. Thus, in the second year of the program, the positive findings were reduced by almost two-thirds.

In 1952, only 9.0 percent of the samples examined contained excess water. Part of this decrease was due to the change in policy from reporting 3 and 4 percent findings. However, in 1953 the positive findings were further reduced to 4.7 percent. The extent of watering appears to have leveled off now, for examinations on 16,370 samples in 1954 yielded only 3.3 percent positive for excess water.

## **The Anthrax Epizootic In Louisiana in 1954**

*brief*

In 1954, Louisiana experienced its first significant anthrax epizootic since 1949. Outbreaks of the disease have been recognized in limited areas of the State each year since about 1880, but epizootics have occurred at infre-

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quent intervals. Until the 1954 epizootic, anthrax appeared to occur in 30-year cycles. The first was recognized about 1890, the second in 1927, in the delta section; and the third in 1949, in the northwestern corner of the State.

Anthrax vaccine was used in each of the epizootics. Still in the experimental stage in 1890, the vaccine was adjudged to have had some bearing on the epizootiology of the disease, but when the supply was exhausted, the infection continued for only a short time. It appeared to burn itself out in northern Louisiana, several miles north of the last vaccinated areas. After the 1927 epizootic, when considerable research on the vaccine was conducted, several types became established on the market. Two types, the subcutaneous spore and the intradermal spore, have become traditional tools in increasing herd immunity to anthrax.

The 1954 epizootic in Louisiana apparently started in the relatively inaccessible delta region during June. The outbreak was recognized as a potential epizootic by July 18 and was confirmed as such by September 7. The last case was proved in the laboratory on October 20. Subcutis spore vaccine (No. 4) had been used extensively, but apparently it was not effective as administered.

Investigation of the epizootic was hampered by the type of terrain in the delta region and to some extent by the nature and customs of its people. The season, the temperature-humidity ratio, the sucking insect population, and the spread of the disease in a northerly direction appeared to be similar in all the epidemics that have occurred in the State so far.

The anthrax bacillus was isolated from a horsefly removed from a dying horse in the Venice area and from a fly taken from a febrile cow in the New Orleans area. Horsefly cultures were especially pathogenic for mice and displayed heavy capsular formation either directly from mice or when inoculated from first and second subcultures. However, no unusual cultural characteristics were observed.

## Orientation of Dentists In Administration

**brief** In mid-20th century, the dentist is a highly skilled technician in an intensively specialized health practice. Throughout his 4 years of study, the pressure is on to develop, simultaneously, scientific background and judgment and the manual skills of dentistry. In recent years patient education, regimens of treatment, and certain techniques of prevention have occupied an increasing but inadequate segment of the dental school curriculum. Yet in practice the dentist must meet community responsibilities as well as responsibilities for individuals. As a professional health practitioner, he must accept this role cast for him by the public.

To successfully accomplish these things within 4 years is a credit not only to the students but also to the pedagogical abilities of the school faculties. To be able to enter the competent practice of a profession upon graduation from school and licensure is evidence of the intensiveness and effectiveness of the course.

More important, however, to this discussion is the fact that such an intensive experience in health science, in methodology, and in technique makes for a high degree of specialization focused on the individual and his pathology.

### Orientation

Like the physician, particularly one trained in a medical specialty, the dentist in public health has the double problem of unlearning the attitudes of individual care and developing the philosophy of the community as the patient. Yet, both the physician and the dentist undertook their course of study because of a real interest in the practice of the chosen profession.

The role of the dentist in public health administration must, there-

fore, be predicated on adequate public health orientation or training through which he has had opportunity to redirect his interests and philosophy to a different type of patient—the community. No longer should the correction of defects or disappearance of pathology in an individual be the objective, but rather the dental health of a group of people for all of their lives becomes his aim.

The second prerequisite for the dentist in public health administration, growing out of this change, must be the concept of family and communitywide service. Not only the potentiality of resources in a community to solve its own problems but the requirement of professional teamwork to exploit this strength must become a way of life for each public health worker. How the specialized professional skills of doctors, nurses, engineers, dentists, sanitarians, clerks, and so forth are integrated and coordinated determines to a great extent the effectiveness of the public health team. And effectiveness cannot be achieved without full realization of these facts by each member of the team.

The physician is ordinarily the leader of the public health team, and, in fact, by law in most States, the responsibility for local and State health departments must lie upon a physician. To meet this responsibility and to serve adequately as leader of the organization, he must become a generalist in many other public health sciences. His basic profession becomes only a part of the spectrum of skills which he and the community must use to create a state approaching complete well-being. The less provincial he remains with respect to medicine, the more effective he is as a public health administrator. And this holds true for one who is to assist in administration.

For any professional person in public health, therefore, a basic decision must always be made, usually early in his experience—do I wish to be a public health or a program administrator? For the former the entire field becomes the generalist's bailiwick. For the latter, the program becomes the specialist's area in which his profession may remain his

primary interest, though it must still be seen in proper relation to the other fields of public health.

### Public Health Duties

The dentist may effectively be an administrator of the dental public health program. In this responsibility he must solve such problems as competence of professional individual care in the community; availability of care to all members of the community; development of the attitudes and philosophy of health maintenance and promotion, as well as correction; and the application of preventive measures, such as nutrition, topical fluoride, and fluoridation of public water supplies. He should be delegated the authority to represent the health department in dental matters; to expedite dental health education activities, and to serve as liaison with dentists and their organizations. He must be able to evaluate dental programs, promote professional growth in the dentists, and insure the application of community resources to all of the community needs. And in doing *these things* he must have a sympathetic appreciation of the entire public health program, supporting it even as he works within his own field.

A second possibility for the trained and experienced dentist is in general public health administration. The educational background in the health sciences, once the transition to public health philosophy has been attained, should make the dentist invaluable in public health administration provided he can be comfortable in this relation to the health officer. Medical people need training and experience in the matter of delegation and sharing responsibility but can make this transition. The dentist, like a physician, must become a generalist, leaving behind the concentrated interest in one profession for the overall team approach. Yet, like the physician with the minimum of clinical medicine as a taproot to his profession, so would the dental administrator wish to keep contact with his parent profession.

In either instance, the dental public health administrator, who has successfully made the transition

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from individual to community for a patient, and to health maintenance and promotion and prevention of disease as an objective rather than the correction or repair of disease, will derive deep satisfaction from his practice.

And satisfaction in the job he has done and the consciousness of important service rendered leave little for a professional to want.

## Inter-American Health Program Since 1942

**brief** Competent observers agree that there has been startling and thrilling improvement in the health of people living south of the Rio Grande. That this is so, they also agree, is due to the aggressive activity of public health workers in the countries of Latin America, living and working in a land with a future.

Real help in the form of stimulation and technical assistance has come from foundations such as Rockefeller and Kellogg and more recently from international and national official agencies such as the Pan American Sanitary Bureau and the International Cooperation Administration—the new agency assuming the functions of the Foreign Operations Administration.

Since 1942 the United States Government, through the Institute of Inter-American Affairs, has been offering technical assistance to the ministries of health of Latin America. The IIAA, as it has become well known, now continues its

work as part of the International Cooperation Administration.

As of today there are cooperative bilateral health programs with 18 sovereign republics in Latin America and with the 3 semi-independent governments of Surinam, British Guiana, and Jamaica. This work is carried on by 135 United States professional health workers and more than 2,000 professional workers from the Latin American countries. An additional 5,000 subprofessional and clerical workers are employed in the operational phases of the programs.

The work is financed by an annual appropriation on the part of the United States of approximately \$5 million. The United States contribution is more than matched by the Latin American governments. Last year they appropriated more than \$12 million in local currencies.

It is unnecessary to describe in detail all the activities that have taken place since 1942. Programs of basic sanitation, community health promotion, and professional education have received priority by common consent.

Within the past 18 months some important changes have been made in the orientation of some of the cooperative programs with the separate countries. Characterized in the early years by operational projects, often turned over completely to United States technicians for professional management, more and more the operational phases are properly being assumed by the Latin American ministries of health. Technical advice and consultation continue to be offered by our technicians working directly with the ministries. This encouraging trend is receiving the active support of the International Cooperation Administration.

During this same period, in addition to continuing work in all of the original fields of health activity, an effort has been made to expand into new fields in order to keep up with the needs of a rapidly developing region. Work has been started in health education, nutrition, industrial hygiene, and medical education. Assistance has been given in organizing a model State health department in Brazil, the largest and one

of the more decentralized countries of Latin America.

A pleasant aspect of the inter-American health picture is the maturing relationship among the several agencies, public and private, working in this field of international health. The International Cooperation Administration is participating actively in efforts to improve this coordination. Joint planning with the Pan American Sanitary Bureau in medical education and mass disease control is part of this effort. The Pan American Sanitary Bureau has established, in Washington, D. C., a center for the exchange of information on medical education to which all interested agencies make contributions. By such formal means, and by means of frequent friendly informal exchange of ideas and information, a fine working relationship has developed.

This bright picture I have painted is not intended to convey the impression that all, or even most, of the problems are solved. Latin America still faces towering problems in public health, in many areas with grossly inadequate resources. The region supports only 1 physician per 3,000 population and 1 nurse per 15,000. Training facilities for both physicians and nurses need improvement. There are still mass disease control problems in such fields as malaria, diarrheal disease, and tuberculosis. Much remains to be done, but movement is occurring, and in the right direction.

Although the ministries of health have good leadership at the top, there are deficiencies in depth. Many more trained workers in the public health professions are needed at the local level. Considerable work still needs to be done in extending public health services to this level.

In moving to meet its needs, Latin America has available some fine resources. They are mostly governmental, however, since the voluntary health organization, as we know it in the United States, is not well represented in Latin America. For this reason a major effort of the cooperative health program is encouragement of voluntary health agencies to complement the work of official agencies.

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*"History is simply the biography of the mind of man; and our interest in history, and its educational value to us, is directly proportionate to the completeness of our study of the individuals through whom this mind has been manifested."*

—OSLER

## *Contributions by Medical Undergraduates to the Science of Preventive Medicine*

By WILLIAM C. GIBSON, M.D., D.Phil.

THE AVERAGE student today is likely to greet with a mixture of amusement and pity any suggestion by his teachers that he might make a lasting contribution to medical science. Students have wallowed through mountainous academic seas for so long in convoy fashion—the speed of the fleet being set by the speed of the slowest ship—that their imagination has been blunted, if not embalmed. It is in the hope of resurrecting some of the keenness of students' first bright days in medical school that the following essay on student contributors of the past is presented. The inquiring, restless mind of the uninhibited undergraduate is still our greatest asset in medicine and the greatest deterrent to smugness in research.

Educators and administrators also would do well to review in retrospect the lives of past contributors in the field of preventive medicine, for in such a study there may be found the key to further recruiting and development of exceptional personnel. I mention educators because

the critical ingredient—gray matter—passes through their hands. Their attitude, as we shall see throughout this paper, can be absolutely determinative. They can foster discovery, or they can impede it. I mention administrators, for they face a dilemma—they have to make existing methods work while insuring that they are not brushing aside as a "nonconformist" some potential discoverer.

### Smallpox

Appropriately, this review is opened with a reference to Edward Jenner, who combined early vision, fortitude in the face of powerful critics, and a life-long delight in clinical investigation. Jenner found himself, in 1768 at the age of 19, a quaking medical apprentice noting down a patient's history, possibly one of his first. The patient was a milkmaid who, on being questioned about any possible smallpox in her history, replied, "I cannot take that disease for I have had the cowpox." Thus, the fledgling Jenner encountered early in his career the common belief among the country people of Gloucestershire that there was a harmless preventive of smallpox. Perhaps his newness to the study of medicine caused him to listen

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long enough to this patient's replies to gain something of value. His countryman William Withering was to stumble on the virtues of digitalis in a similar rural setting in Shropshire.

Jenner became, as have many since, a student unpopular with his teachers, for he kept bringing up his fantastic theory, as from the back pasture. However, he lived in John Hunter's house while studying in London, and his patron greatly encouraged the thoughtful undergraduate. Hunter's philosophy was couched in his immortal advice to Jenner, "But why think, why not try the experiment."

Jenner graduated at the age of 22, and, despite an offer to accompany Captain Cook on a world-circling expedition, he returned to his native Gloucester to practice and to build up a set of records on simple, clear observations. So cautious was Jenner that he vaccinated no one for 30 years after his undergraduate conception of vaccination. Then came Sarah Nemes—the source—and James Phipps—the subject. And Jenner's campaign, for he was a campaigner, was launched.

John Hunter had been dead 5 years by the time Jenner was ready to publish the results of his inquiry. Jenner turned to the Royal Society in 1798 for an audience and was rebuffed with the advice that he "should be cautious and prudent . . . and ought not to risk his reputation by presenting to the learned body anything which appeared so much at variance with established knowledge, and withal so incredible."

The same advice had been given Franklin by the same body in 1752 when he reported on his derivation of electricity from the clouds. The type of advice offered Jenner, who happens to have been a keen balloonist, was 140 years later to be tendered another aeronaut Frank Whittle, the jet propulsion pioneer, on the grounds that he was still a Cambridge undergraduate and his theory was "incredible."

## Tuberculosis

In another area—that of tuberculosis—one is struck by the student contributions of the impecunious, observant, and industrious René Theophile Hyacinthe Laennec. Before graduation in Paris in June 1804, he had written papers on mitral valvular disease and on "in-

flammation of the peritoneum" under the stern and powerful Dupuytren. He had discovered the subdeltoid bursa and had also shown that hydatid cysts were due to parasites. In March of 1804, he gave an address on what he called "pulmonary tuberculosis," in which he showed "phthisis" to be tuberculosis of the lungs.

Laennec learned of percussion from Jean-Nicolas Corvisart, who brought this clinical application of an innkeeper's barrel-tapping technique into use 47 years after Leopold Auenbrugger had first described it. Laennec's great book on auscultation appeared in 1819, and by 1825 we find William Stokes, as an Edinburgh medical undergraduate, singing the praises of the method in his book, the first work in English on auscultation, entitled "An Introduction to the Use of the Stethoscope with its Application to the Diagnosis in Disease of the Thoracic Viscera; Including the Pathology of Various Affections."

An unsung American contributor in the history of tuberculosis is James Jackson, Jr., of whom Osler wrote: "Jackson's name . . . will always be associated with the studies on emphysema, and he is the discoverer of the prolonged expiration in pulmonary tuberculosis." As an undergraduate Jackson studied with the great French clinician and pathologist Louis. In 1832 he sent home to New England an article on cholera based upon his experience with Louis in an epidemic in France. While preparing to write his M.D. examinations at Harvard, he was stricken with dysentery and died at the age of 24. Louis' letters to Jackson's father asking if the son could not spend another year in his clinic in Paris are very touching.

Another American pioneer in tuberculosis was James Blake (1815-93). In 1860 he was recommending and practicing the open-air rest treatment in a sanatorium on the summit of Monte Sol in California to the east of Mount St. Helena where Robert Louis Stevenson later lived. Blake's student contribution had been the arranging of the elements into a periodic table on the basis of their physiological effects. This was done when Blake was an undergraduate in London, aged 23. Mendelejeff, usually credited with the periodic table, was 4 years old at the time of Blake's publication. Blake's student discovery was made under the benev-

olent eye of William Sharpey, as were those by Lister and Huxley.

### Puerperal Fever

Ignaz Philipp Semmelweis and Oliver Wendell Holmes had interesting student preparations for their eventual encounter with puerperal fever. As an undergraduate Semmelweis was experimenting on rabbits with tartar emetic, at that time a preferred "remedy" for

man must take physic because he is sick. . . . My aim has been to qualify myself . . . not for a mere scholar, for a follower after other men's opinions, for a dependent on their authority—but for the character of a man who has seen and therefore knows, who has thought and therefore has arrived at his own conclusions." Holmes, the Bostonian, a nationally known poet at 21, little suspected that a fiercely independent Hungarian practicing in Vienna unknowingly would be his ally. Holmes' pen was mightier than the swords of his obstetrical compatriots. Semmelweis maintained his doctrine against frightful persecution because he knew he was right and he had the support of his teachers Rokitsansky, Skoda, and Hebra.

### Cellular Pathology

One of the great concepts introduced in the last century was that of "cellular pathology." Rudolf Virchow as an undergraduate in Berlin decided to test the prevailing theory that inflammation was vascular in origin by studying it in the cornea, a nonvascular tissue. His graduation thesis, written in 1843, was entitled, "De rheumate praesertim corneae." We believe from a letter of 1841 written to his father in the country, asking for more rabbits, that he had been engaged on it at least 2 years prior to graduation. Virchow's student work on the cornea determined his later opinions on the cellular basis of inflammation and doubtlessly influenced his outlook on the fundamentals of pathology.

The distinguished physician-educators Sir James Paget and Sir William Osler were student investigators, strangely enough, in the same field. As an undergraduate at St. Bartholomew's Hospital Medical School, London, Paget in 1835 discovered the cysts of *Trichinella spiralis* in the muscles of the cadaver he was dissecting. In 1870, William Osler, a first-year medical student at the University of Toronto, was removing these trichinae from a cadaver and trying to infect cats, dogs, and rabbits with them. Osler entered medicine with training in the preparation of biological specimens, received at the skilled hands of James Bovell and Father Johnson at their school in Weston, Ontario. On graduation at McGill Medical



"... not to take authority when I can have facts, not to guess when I can know . . ."—Holmes.

pneumonia. Holmes, like Semmelweis, had spent a brief apprenticeship in law—a discipline which was to serve them, and humanity, well in the struggle to which their methodical investigation brought them. Holmes began the study of medicine under James Jackson, Sr., in Boston and continued it in Paris, along with Jackson's son already mentioned. In a letter sent to his home in Boston, he alluded to his student "discoveries": "I have more fully learned at least three principles since I have been in Paris: not to take authority when I can have facts; not to guess when I can know; not to think a

Faculty in 1872 his thesis was accompanied by such excellent histological preparations that he was awarded a special prize. Osler's early bent toward pathology was evident throughout his long clinical career. It remained for an undergraduate at Johns Hopkins Medical School, Thomas R. Brown, to discover in 1898 the eosinophilia seen in trichinosis.

David Gruby, the father of medical mycology and discoverer of the cause of favus, was in 1835 an undergraduate protégé of Carl Rokitsky, the celebrated teacher and pathologist at the University of Vienna. Gruby wrote his first paper on "The Morphology of Pathological Fluids." His study concerned the cell forms in pus from different diseases. The story of the hardships faced and overcome by this remarkable spirit are well-nigh unbelievable. He acquired his early schooling by listening outside a classroom from which he was barred on religious grounds. He was apprenticed to a lens grinder, and as a result he was able to make his own microscope when he entered medical school. Despite the fact that he earned his passage through medicine by tutoring, he nevertheless found time for research under Berres and Rokitsky, the latter permitting him to use his "best microscope" for it. Once again does Rokitsky, the teacher of pathology, enter upon our stage.

### Oroya Fever

Daniel Carrion is probably the only medical student in history to have a medical school and several hospitals named after him. Separated as we are by a period of 70 years from his death from Oroya fever, administered to him in the course of his student research project, it is hard for us to realize the impression which his death made on Latin American medical and scientific circles. As early as 1858, a medical student named Tomas Salazar wrote in his graduation thesis, "Historia de las Verrugas," that this disease was waterborne. Since the Conquest it had been regarded as the equal of the "pest," and in the year 1870 alone had taken the lives of 7,000 workmen completing the trans-Andean railroad into Oroya, Peru. Carrion became interested in the problem and during va-

cations sought out cases and plotted them on a map of the area. Only near Oroya was the disease endemic. The clinical picture of high fever, profound weakness, joint pains, anemia, and leukocytosis was well known, but the cause was still a mystery. Some called it acute pernicious anemia, some atypical malaria, while others said it originated from the hot springs. On August 27, 1885, Carrion, against all advice, received an inoculation of blood from a 14-year-old boy suffering from the typical verruga peruana skin eruption. He was going to prove, once for all, the connection between Oroya fever and verruga peruana. After 3 weeks of excellent health he suffered muscular pains and prostration, with severe anemia. The post mortem was an important contribution to an understanding of the disease. The Peruvian student had answered the question of the connection between the two diseases.

Patrick Playfair Laidlaw as a Cambridge undergraduate, at the turn of the century, carried on an important investigation on hemoglobin derivatives in the biochemical laboratory of Sir Frederick Gowland Hopkins. This set the stage for his postgraduate work on histamine with Sir Henry Dale and for his lifelong researches into distemper and influenza. Hopkins must be listed among those who most encouraged young investigators.

William George MacCallum entered Johns Hopkins Medical School in 1894 bearing a gold medal from the University of Toronto for an important contribution on worm parasites. In his final year as a student at Johns Hopkins he reported on his studies of malarial parasites in birds. He supplied the missing link in the life cycle of the parasite, showing the flagellated form to be the sperm cell. Sir Ronald Ross, who had interpreted it as a flagellated spore escaping from a female cell, wrote years later: "I have ever since felt disgraced as a man of science!" MacCallum's later discovery of the role of the islet cells of the pancreas in diabetes became the springboard for Banting's revolutionary work, aided by the youthful Charles Best. In fact, as we shall see, the islet cells had been discovered by a medical student, Paul Langerhans.

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An Inquiry into the natural  
History of a Disease known in  
Gloucestershire <sup>by</sup> ~~under~~ the name  
of the Low-pox

The deviations of Man from the state  
in which he was originally plac'd by Nature  
seem to have proved to him a prolific  
source of Diseases. From the love of  
Splendor, from the indulgence of Luxury, &  
from his fondness for amusement, he has  
familiariz'd himself with a great number  
of animals ~~that~~ <sup>which</sup> may not originally have  
been intended for his associates. The Wolf,  
disarm'd of ~~its~~ ferocity, is now pillow'd in  
the Lady's lap\*. The Cat, the little Tyger of

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\* The late Mr John Hunter proved by experiments  
that the Dog is the Wolf in a degenerated state.

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Reproduced above is the first page of William Jenner's classic which he presented to the Royal Society in 1798—three decades after he had noted the comment of a Gloucestershire milkmaid

that she once had cowpox and therefore could not get smallpox. The Royal Society reprimanded him for this "incredible" paper, "so much at variance with established knowledge."

## Chemotherapy

The father of modern chemotherapy, Paul Ehrlich, stated his great side-chain theory as a medical student. Encouraged by one of his teachers, Waldeyer, at Strassburg, Ehrlich began in 1877, by testing the staining qualities of many of the aniline dyes just coming into commercial use in Germany. After transferring to the University of Breslau he had the opportunity of working in the laboratories of Conheim and Heidenhain. While still an undergraduate Ehrlich described, in the *Archives of Microscopic Anatomy*, his experiments on histological staining which brought him to the "idea of a chemical binding of heterogeneous substances to the protoplasm." The rest of Ehrlich's life was spent in developing this great generalization in the fields of immunity, bacteriology, and chemotherapy. The key to Ehrlich's research lay in the aniline dyes, the first of which was synthesized by an 18-year-old English chemistry student William Henry Perkin. Two years later Archibald Scott Couper, as a student in Paris, proposed a valency of four for carbon and showed that it formed long-chain compounds. It took the genius of Ehrlich, a chemist with great stereovisual powers and interest in tissues, to bring together into a fundamental concept all that had gone before.

## Public Health

John Shaw Billings has been described as America's greatest contributor to scientific medicine. He was a born inquirer rather than the product of famous teachers. As a student, writing an essay on the surgical treatment of epilepsy, he came to realize the utter lack of any index to the world's medical literature. He lived to remedy this, through the Index Catalogue and its successors in the library of the Surgeon General of the United States Army.

However, our interest in Billings here stems from his campaigns in the fields of sanitation and hospitalization. As an impoverished student at the Medical College of Ohio in Cincinnati from 1858 to 1860, Billings paid his way by serving as caretaker of the dissecting rooms and by "living in" at one of the city's hospitals. This latter appointment caused him to think

more about the organization of hospitals—or possibly lack of it—than did contemporary administrators. He found out where things could "go wrong" in institutions and he developed a keen sense of smell with regard to these matters.

It is little wonder that on his first Army posting in the Civil War Billings excoriated Cliffburne General Hospital in Washington, D. C., as being "in an extremely filthy and dilapidated condition,—no drainage whatever, . . . no sinks, no water within half a mile." He was later to describe the United States Army as "the best fed and the worst housed" in the world. His suggestions for reorganizing the marine hospitals and his sanitation reports on Army military posts were blunt and forceful. One of his interests was vital statistics, and in 1880 he suggested to the Government that the data compiled from the census "might be recorded on a single card or slip by punching small holes in it, and that these cards might then be sorted and counted by mechanical means according to any selected group of these perforations."

Billings' stimulating influence was to be felt in his work as director of the laboratory of hygiene at the University of Pennsylvania, as designer of the Johns Hopkins and Peter Bent Brigham Hospitals, and in medical education and libraries. When asked how he accomplished so much he replied: "There is nothing really difficult if you only begin. Some people contemplate a task until it looms so big it seems impossible. But I just begin and it gets done somehow. There would be no coral islands if the first bug sat down and began to wonder how the job was to be done."

Thomas "Phenomenon" Young, that many-sided genius who discovered in his first days at medical school that the lens of the eye varies its shape in accommodation was an early constructor of life expectancy tables and of insurance formulas. His first was published in 1826 as "A Formula for Expressing 'Decrement of Human Life.'" In his theory of color vision—rediscovered years later by Helmholtz—in his accurate measurements of the size of red and white cells of the blood, in the deciphering of the Rosetta stone, in developing the modulus of elasticity, in setting out a phonetic alphabet for all languages, in standardizing the imperial gallon, and in his writings on gaslighting,





"There is nothing really difficult if you only begin. . . . There would be no coral islands if the first bug sat down and began to wonder how the job was to be done."—Billings.

Young made himself one of the most celebrated scientific contributors of all time. If he were alive today we would find him, doubtless, energizing the Food and Agriculture Organization with reports of his observations on the production of better wool and meat through crossbreeding and of increased food production through irrigation, matters which he studied as a medical student. His drive to understand things was inexhaustible and his capabilities truly Newtonian.

### Nutrition

The field of nutrition reveres the name of Sir Frederick Gowland Hopkins for his early researches on "accessory food factors" which we now call vitamins. Before graduation in medicine, Hopkins published a paper on the pigments in the wings of the English brimstone butterfly. He found the pigment to be a derivative of uric acid and, in his typical way, immediately improved the method for the determination of uric acid. This method was the key to his succeeding researches on nitrogenous

compounds. As he investigated the effects of artificial diets composed of purified proteins he became aware of "unidentified accessory food factors" and pursued them, with what great success we all know today.

To follow briefly this lead in nutrition one finds the field of carbohydrate metabolism bristling with student contributors. But, it is the disease diabetes which absorbs us as physicians interested in public health problems. Paul Langerhans discovered his famous "islets" in the pancreas 2 years before he graduated in medicine. Virchow had given him encouragement and laboratory space in 1867, and his graduation thesis, completed in 1869, is an historic document. In 31 pages he described his discovery, adding: "There is indeed hardly another organ in which there is such glaring contrast between the brilliant results of physiological research and the complete darkness in the realm of anatomic knowledge."

The deposition of calcium in the teeth and bones of the body was poorly understood until the Swedish medical student, Ivar Sandstrom, in 1877 discovered the parathyroid glands. True, it remained for W. G. MacCallum and others to demonstrate the physiological principles involved, but Sandstrom's investigation as a 25-year-old student at Uppsala was basic to further progress. His paper was returned to him by a German editor as being too long to publish. The fact is that the paper was so thorough that little has been added to the subject since!

At a time when cardiovascular disease is receiving such attention we would do well to review the student work of Jean L. M. Poiseuille. In 1828 he wrote his M. D. thesis in Paris on "Recherches sur la force du coeur aortique" and in it described his revolutionary mercury manometer for registering blood pressure. Using this instrument he was able to show the rise and fall in the recorded blood pressure with each heart beat, and he actually calculated the degree of dilation of the arteries with each systole.

Aviation medicine has had a number of interesting undergraduate devotees. Alphonse Gal, while a medical student in Italy, served in 1872 on a "mother ship" for sponge divers operating off the Turkish coast. He was the first



to describe the itching which goes with "the bends" in deep sea divers. The father of aerial photography, Felix Tournachon, was a medical student. Known as "Nadar," he, like Jenner, was one of the early balloonists. With this reference to the latest specialty we must conclude this account.

Certainly, one thing is clear from this brief review of 2 dozen student contributors of the past: Good seed can be helped greatly by good soil. The determining factor has often been the provision of facilities for a student investigator by a sympathetic teacher. The lesson for us

today would seem to be clear. Summer research scholarships in all fields of medicine and its ancillary sciences are likely to repay us handsomely as educators. Encouragement of original work by undergraduates is in the best tradition, as I have tried to show in this paper, and offers one method of offsetting the homogenizing influence of too many specialty boards. Student curiosity can be depended upon to bring to light new facts of major importance, as it has in the past. The shaping of the conditions under which such students will work and grow is a major challenge to all educated people.

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## Medical Research Fellowships

The Division of Medical Sciences is accepting applications for National Academy of Sciences-National Research Council postdoctoral research fellowships for 1956-57. The following programs, offered only—except as indicated—to American citizens under 35, are available:

Study in all branches of the biological, chemical, and physical sciences, and of clinical investigation applicable to the study of typical or malignant growth: also, exchange fellowships open to American and British scientists for advanced study in specialized fields pertaining to growth. These awards are sponsored by the American Cancer Society.

Fellowships in the basic medical sciences. These awards, also open to Canadian citizens, are supported by the Rockefeller Foundation.

Study in fields related to tuberculosis, supported by the National Tuberculosis Association. Applicants must be graduates of American schools.

Preparation for radiological research. Appointments to this program, sponsored by the James Picker Foundation, are not limited to citizens of the United States.

The closing date for applications is December 1, 1955. Forms may be obtained from the Fellowship Office, National Academy of Sciences-National Research Council, 2101 Constitution Avenue, NW., Washington 25, D. C.

| *Data on vital events, communicable diseases, and sanitation reported  
by 22 American countries signify progress in neighbor nations.*

# Report of Health Conditions in the Americas

By GUSTAVO MOLINA, M.D., M.P.H., and  
RUTH R. PUFFER, Dr.P.H.

NEED for a numerical statement of facts, with precision and reliability, has been a matter of prime concern to persons interested in coordinated health planning in the Americas. Since establishment of the Pan American Sanitary Bureau in 1902, improvement in collection of statistical data has been one of the important objectives of the organization. Although achievement of this objective has been given impetus by the many requirements of the Pan American Sanitary Code in relation to statistics and reports, only in recent years has it received concentrated effort.

A major goal in fulfillment of the requirements in the Pan American Sanitary Code was

the publication of the Summary of Reports of Member States, 1950-53, which was prepared for the XIV Pan American Sanitary Conference held in October 1954. This document consolidates the statistical data on health conditions for the years 1950 through 1953 that were submitted by each of the 21 member states of the Pan American Sanitary Organization. Included are data on population, vital events, reported cases and control of communicable diseases, personnel and organization of health services, and various aspects of sanitation programs. Since release of the summary, similar reports have been received from Puerto Rico, Canada, and the territories in the Western Hemisphere, which will be incorporated in a revision of the summary. For the following discussion, selected data dealing with population, vital events, communicable diseases, and sanitation from the reports of the member states and Canada are presented. These data provide a basis for appraisal of general health conditions in the Americas.

## Population

Nearly all the countries in the Americas conducted a census in or about 1950, and on July 1 of that year the population was estimated to be 326,415,000. Of this population, 216,443,000

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*Dr. Molina is chief of the division of public health of the Pan American Sanitary Bureau, and Dr. Puffer is chief of the division's epidemiology and statistics section. Assistance in presenting the vital statistics data in this paper was provided by Jean Peabody, a member of the staff of the epidemiology and statistics section. The paper was read at the 23d annual meeting of the Southern Branch of the American Public Health Association in New Orleans, May 10-13, 1955. It is scheduled to be printed in Spanish in the October 1955 issue of the Boletín de la Oficina Sanitaria Pan-Americana.*

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**Table 1. Percentage of population in 4 age groups for 3 regions of the Americas according to recent census in 18 countries**

Region	All stated ages	Under 15 years	15-34 years	35-54 years	55 years or more
Northern America	100.0	27.2	30.5	25.5	16.8
Middle America	100.0	41.8	32.8	17.9	7.5
South America	100.0	40.0	34.3	18.4	7.3

lived in North America and 109,972,000 in South America. In Alaska, Canada, Greenland, St. Pierre and Miquelon, and the United States, which is called Northern America, were 165,110,000 people, and in the remainder of North America (including the islands of the Caribbean), which is designated Middle America, were 51,333,000.

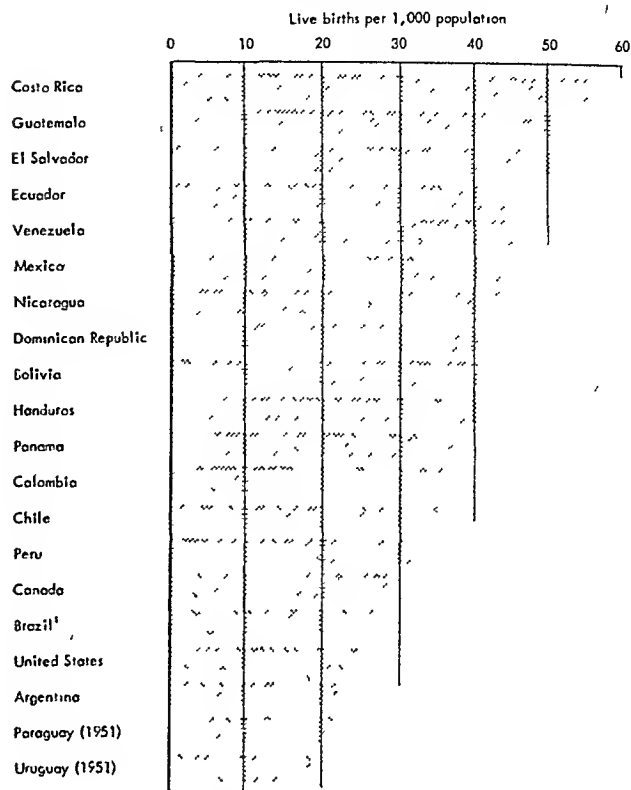
Division of the population into age groups, as presented in table 1, demonstrates a sharp difference between Middle and South America and Northern America. In Middle and South

**Table 2. Birth and death rates per 1,000 population and infant death rates per 1,000 live births in 20 American countries, 1952**

Country	Birth rate	Death rate	Infant death rate
Argentina	24.6	8.7	67.5
Bolivia	42.1	15.6	184.6
Brazil <sup>1</sup>	27.1	15.7	172.9
Canada <sup>2</sup>	27.9	8.7	38.0
Chile <sup>3</sup>	36.5	13.7	121.8
Colombia	36.8	13.0	110.7
Costa Rica	54.6	11.6	80.2
Dominican Republic	42.2	10.1	78.7
Ecuador	46.5	17.0	109.5
El Salvador	50.8	17.0	85.5
Guatemala	51.0	24.2	112.2
Honduras	40.1	12.7	64.3
Mexico	43.3	14.8	89.7
Nicaragua	42.8	10.6	77.5
Panama	36.9	8.6	50.4
Paraguay <sup>4</sup>	20.8	7.0	87.7
Peru	31.4	11.2	100.0
United States	24.7	9.6	28.4
Uruguay <sup>4</sup>	18.6	7.9	54.7
Venezuela	44.0	10.8	74.7

<sup>1</sup> Federal District and State capitals, except the city of São Paulo. <sup>2</sup> Excluding Yukon and Northwest Territories. <sup>3</sup> Provisional. <sup>4</sup> 1951. <sup>5</sup> For reporting area, 83 percent of population.

**Figure 1. Live births per 1,000 population in 20 American countries, 1952.**



<sup>1</sup> Federal District and State capitals, except city of São Paulo

America the proportion of the population under 15 years of age is substantially higher than the proportion in Northern America, 42 percent and 40 percent as compared to 27 percent. The proportion in the older age groups is considerably lower in Middle and South America, although the proportion in the age group 15-34 years is about the same in all three regions. These age distributions indicate that in Middle and South America greater priority at present should be given to health programs directed to problems of infancy, childhood, and young adult life.

## Vital Statistics

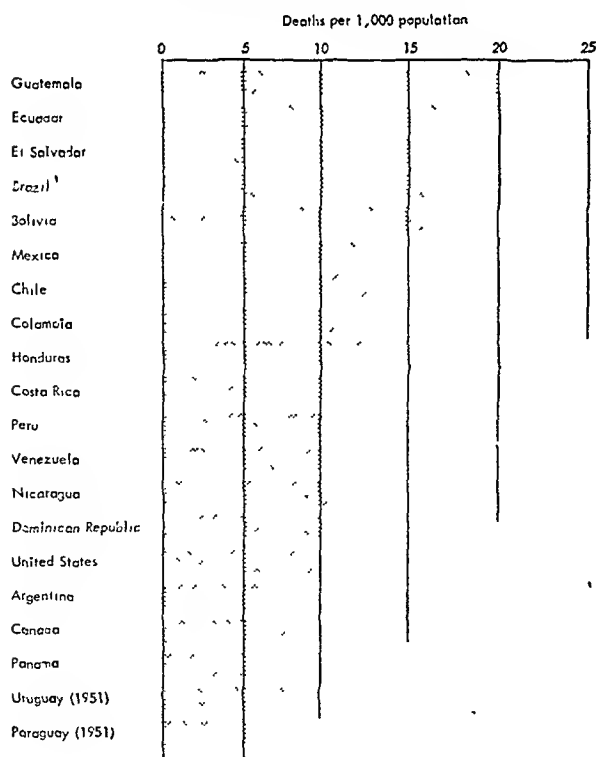
Practices in registering vital events, definitions of terms, and tabulation procedures vary considerably from country to country. Although the reports on health conditions were not concerned with the technical details of the methods of collecting and analyzing data, certain explanations should be made.

The data provided by Haiti were considered too incomplete to be used because this country does not have a vital events registration system. Cuba did not provide any birth or death data. In Brazil, data were available only for the Federal District and capitals of States, except the city of São Paulo. In some of the countries, notably Paraguay, the low rates indicate incomplete registration of births and deaths.

The birth, death, and infant death rates reported by 20 countries for 1952 are given in table 2, and these rates are shown by rank order in figures 1, 2, and 3. Notwithstanding the difficulties involved in providing complete information for the hemisphere, the statistics presently available from birth and death certificates do give valuable clues to the health problems in the various countries. The need for improving vital statistics systems becomes increasingly evident as the data are used.

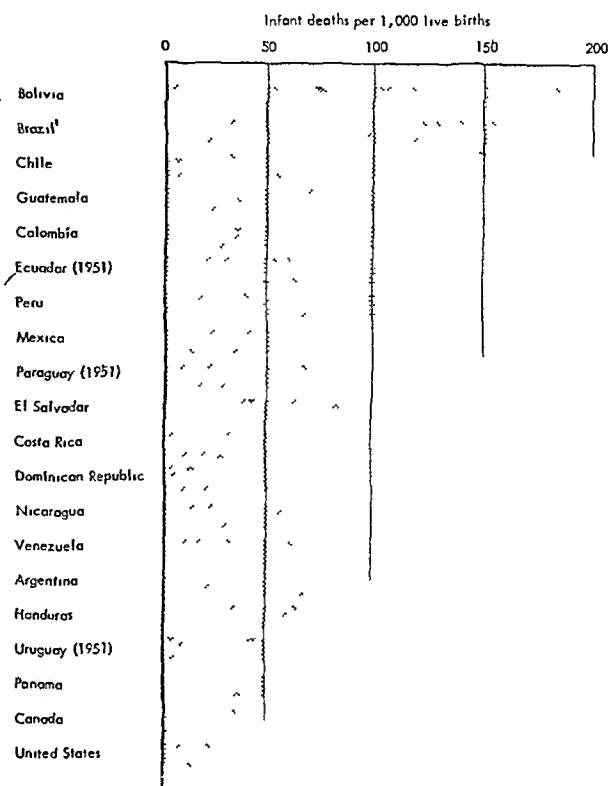
Very high birth rates were noted in many of the countries. In fact, in half of them the rates exceeded 40 per 1,000 population and in 3 countries of Central America they were

**Figure 2. Deaths per 1,000 population in 20 American countries, 1952.**



<sup>1</sup> Federal District and State capitals, except city of São Paulo

**Figure 3. Infant deaths per 1,000 live births in 20 American countries, 1952.**



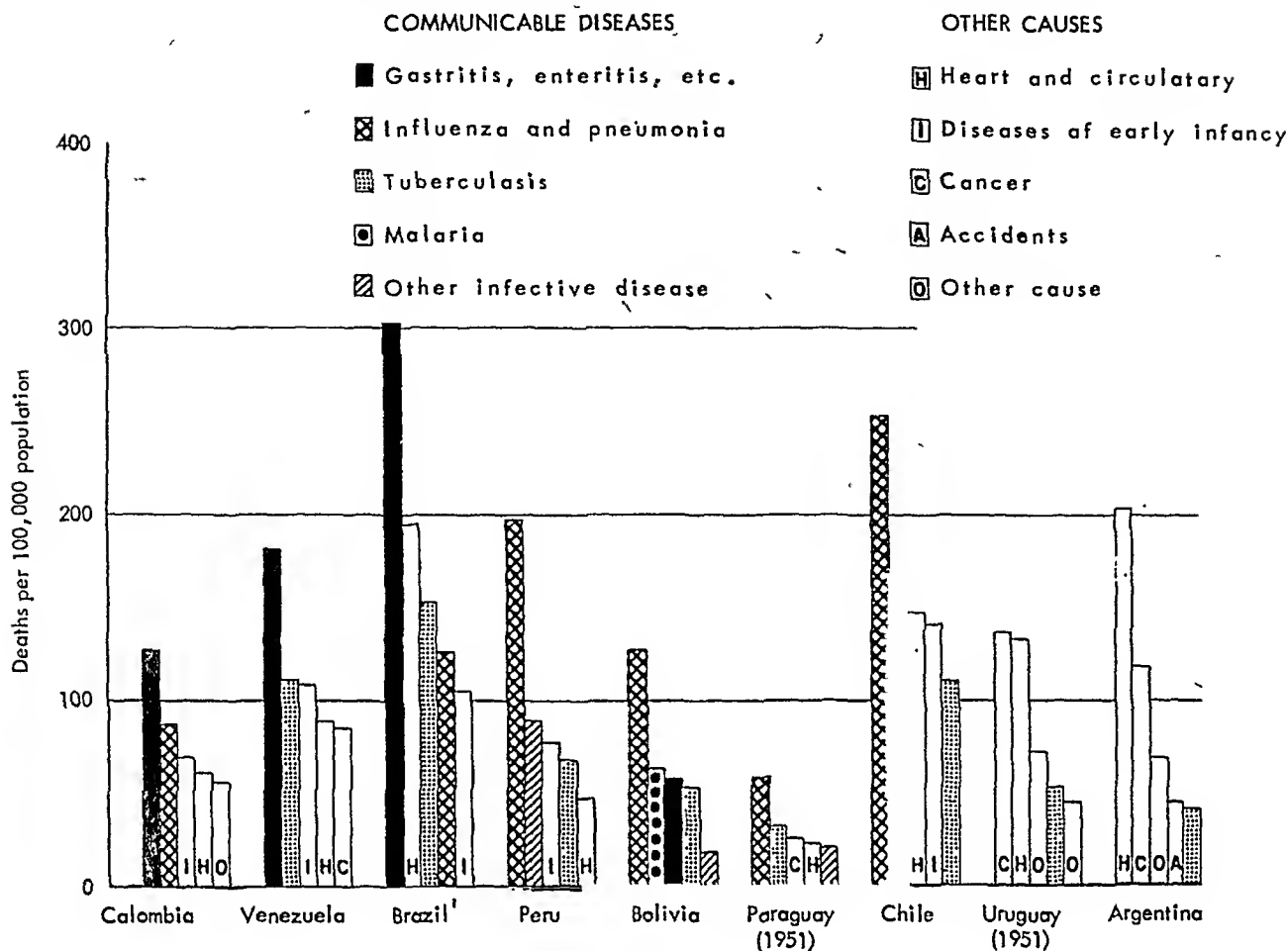
<sup>1</sup> Federal District and State capitals, except city of São Paulo

in excess of 50 per 1,000 population. Such high birth rates indicate that maternal and child health programs are essential for proper care in the prenatal and postnatal periods and in childhood.

Likewise, high death rates were found in several of the American countries, the highest being recorded in Guatemala. Although death registration is incomplete in several countries and the true rates are probably higher, the data indicate excessive mortality in many areas. However, analysis of death rates from specific causes as well as by age group is clearly required for understanding of health conditions.

The range in infant death rates was great, from 28.4 per 1,000 live births in the United States to 184.6 per 1,000 live births in Bolivia. The fact that the United States and Canada have been able to bring their infant death rates down to relatively low figures gives promise that, with the development of health programs, improvement of environmental sanitation, and prevention of infectious diseases, rates can like-

Figure 4. The 5 leading causes of death in 9 countries of South America, 1952.



wise be reduced throughout the hemisphere. Forty years ago, at the time of establishment of the Birth Registration Area in the United States, the rate for the 10 States and the District of Columbia, although probably lower than for the rest of the country, was still around 100 per 1,000 live births. Reduction was steady but not even, with some States maintaining relatively high rates until very recent years. Similar unevenness can be expected in the declines in other countries. In those countries which have put into force vigorous public health programs, clear-cut reductions have been noted, and it is to be hoped that the downward trend will continue.

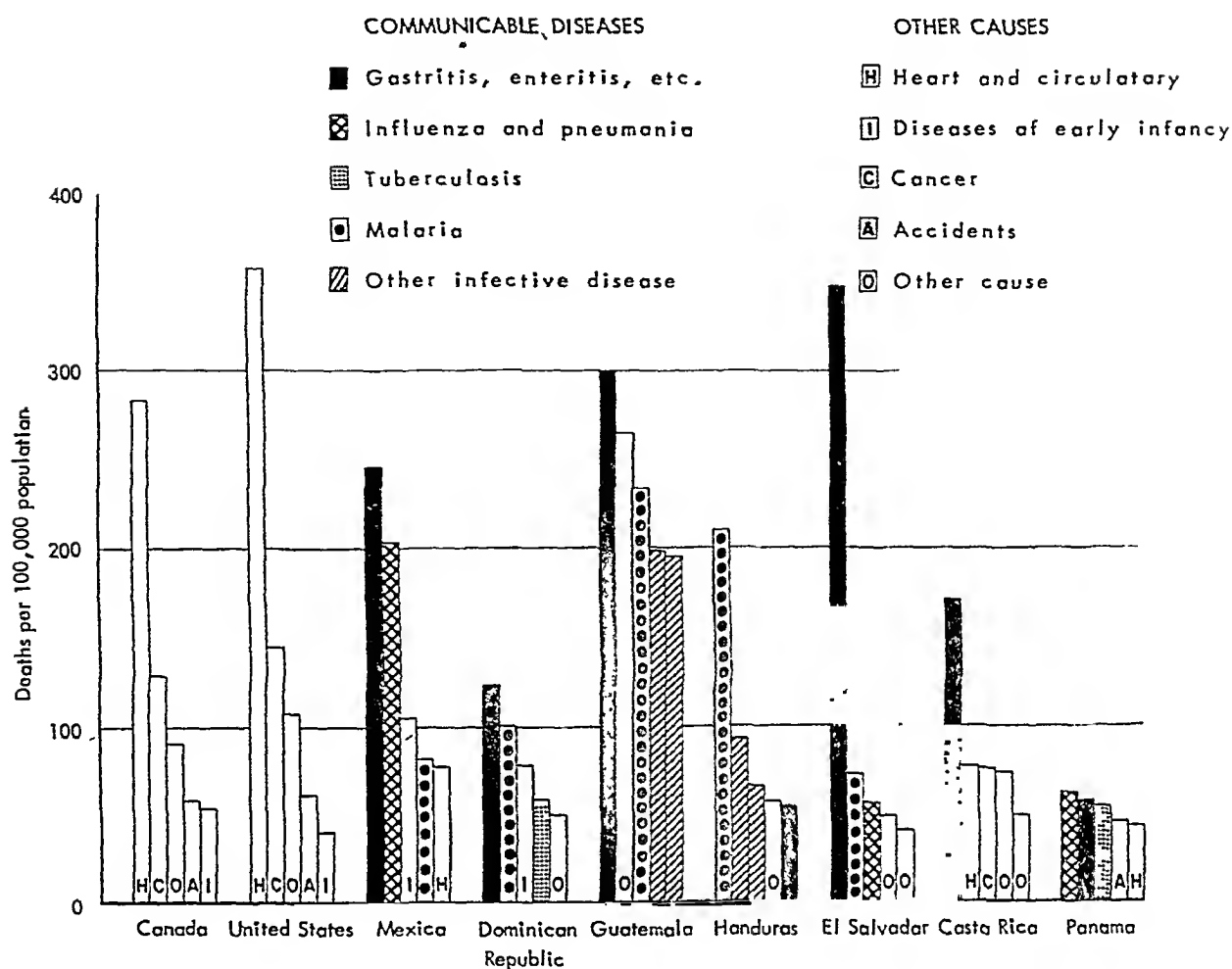
#### Principal Causes of Death

Eighteen countries provided data regarding the principal causes of death. In considering

these data, it must be kept in mind that not all countries used the International Statistical Classification of Diseases, Injuries, and Causes of Death (sixth revision of the International List) and that there was not uniformity in the title numbers used in ranking the causes of death. Moreover, it is known that there are deficiencies in registration and medical certification in certain countries, such as Bolivia, Paraguay, and Peru.

The 5 leading causes of death in 9 countries of South America are shown in figure 4. In the three northernmost countries—Colombia, Venezuela, and Brazil—the gastrointestinal diseases, that is, the diarrheas, which are probably due principally to shigella, were the leading cause of death. In four countries farther from the tropics—Peru, Bolivia, Paraguay, and Chile—influenza and pneumonia were the principal cause of death. In Uruguay and Argen-

Figure 5. The 5 leading causes of death in 9 countries of North America, 1952.



tina, the diseases in the older age groups, circulatory diseases and cancer, stood first.

Figure 5 gives similar data for 9 countries in North America. In Canada and the United States, the infective diseases did not appear among the 5 leading causes. In the other 7 countries, the infective diseases—the diarrheal diseases, malaria, and influenza and pneumonia—appeared frequently.

A summary of the data on principal causes of death is given in table 3. These data point up the importance of the infective and parasitic diseases, for in addition to the diarrheal diseases, which were the principal cause of death in 8 countries and among the first 5 causes in 12 countries, influenza and pneumonia, tuberculosis, malaria, and whooping cough appeared as leading causes. Even though there is lack of uniformity in classifying and ranking deaths

and variations in completeness of reporting and accuracy of medical certification, the data emphasize the need for active programs for prevention of death due to communicable diseases.

#### Communicable Diseases

As has been pointed out, the communicable diseases rank high among the first five causes of death in many countries of the Americas. They contribute heavily to infant mortality and mortality in early childhood. In addition to mortality, furthermore, these diseases are responsible for considerable illness and economic loss. The reports on health conditions provided detailed data regarding 15 communicable diseases, including the number of cases and deaths with rates per 100,000 population. In table 4 are shown the death rates for two of these diseases, malaria and whooping cough.

Table 3. Summary of the 5 principal causes of death by rank order in 18 American countries, 1952

Cause of death	Total	Number of countries by rank order of cause of death				
		1st	2d	3d	4th	5th
Heart disease or circulatory system.....	13	3	3	1	3	3
Gastritis, enteritis, diarrhea <sup>1</sup> .....	12	8	2	1	0	1
Influenza and pneumonia <sup>2</sup> .....	10	5	2	2	1	0
Tuberculosis.....	10	0	2	2	4	2
Diseases of early infancy.....	9	0	0	5	1	3
Cancer.....	7	1	3	2	0	1
Bronchitis <sup>3</sup> .....	6	0	1	0	1	4
Malaria.....	6	1	3	1	1	0
Vascular lesions, etc. <sup>4</sup> .....	5	0	0	4	0	1
Accidents or external causes.....	4	0	0	0	4	0
Whooping cough.....	2	0	1	0	1	0
Other cause.....	6	0	1	0	2	3

<sup>1</sup> Diseases of digestive system in two countries. <sup>2</sup> Diseases of respiratory system in one country. <sup>3</sup> Includes bronchopneumonia in one country and pneumonia in two countries. <sup>4</sup> Diseases of nervous system in one country. <sup>5</sup> Intestinal infections. <sup>6</sup> Avitaminosis and anemias in one country and dropsy in one country. <sup>7</sup> Dysentery, helminths, and syphilis, each in one country.

Malaria is one of the communicable diseases that results in considerable morbidity and mortality in certain areas of the hemisphere. The six countries with the highest death rates are in North America—Guatemala, Honduras, Dominican Republic, Nicaragua, Mexico, and El Salvador. As is well known, malaria has also been a serious health problem in the southern part of the United States. An active eradication program in the United States had almost achieved complete extinction of the disease when the disturbed conditions of World War II and the return of soldiers from heavily infected areas resulted in an increase in cases and deaths. But decline is again in progress: In 1953 only 1,310 cases were reported, and the death rate was estimated to be less than 0.05 per 100,000 population.

The XIV Pan American Sanitary Conference recommended that "the Pan American Sanitary Bureau promote the intensification and coordination of antimalaria work, with a view to achieving the eradication of this disease in the Western Hemisphere; and that the Member Governments should convert all control programs into eradication campaigns within the shortest possible time, so as to achieve eradication before the appearance of anophelene resistance to insecticides." To carry out this resolution, a malaria consultant has been employed; headquarters for the coordination office of the

malaria eradication program have been established in Mexico; countries particularly involved are undertaking active programs; and the United Nations Children's Fund is considering a major increase in appropriations for malaria eradication. Through such coordinated activities, the Americas can be made free of malaria within a short period of time. The excellent antimalaria program in the United States has shown that eradication can be achieved through collaboration of all groups concerned.

The communicable diseases of childhood continue to cause many deaths in the Americas. The death rates for whooping cough, for example, in 5 countries exceeded 30 per 100,000 population in 1952. The rates for this disease were so high in a few countries that doubt has been expressed regarding the accuracy of the statements of causes of death, for it is easy in early childhood to confuse the death due to whooping cough and bronchopneumonia with the death due to bronchopneumonia caused by other diseases. But, even though the data may not be entirely accurate, the size of the whooping cough death rates indicates the need for investigations to determine the causes and for application of preventive measures. Triple vaccine (diphtheria, pertussis, tetanus) was reported to be in use in several countries. The high value and the low cost of this method of

prevention justifies the addition and expansion of programs of immunization against whooping cough.

The International Sanitary Regulations lists six diseases as quarantinable—cholera, plague, louse-borne relapsing fever, smallpox, typhus (louse-borne), and yellow fever. Smallpox continues to occur in several countries, and the case rates in Peru, Bolivia, and Colombia are relatively high. In Colombia, for example, 7,146 cases were reported in 1954. Fortunately, fatality rates for smallpox are generally quite low, indicating that the virus has relatively low virulence. In the light of existing knowledge about smallpox control and about methods of vaccine production and preservation, there is little excuse for continued appearance of this disease. Cases of plague or deaths from this disease occurred in 8 countries in the 4-year period 1950-53, and cases of or deaths from louse-borne typhus were reported in several countries.

Progress in the control of yellow fever and in

eradication of the *Aedes aegypti* has been highly gratifying in several countries. In fact, in six, eradication of the insect vector of urban yellow fever is either complete or in sight. In too many countries, however, much remains to be done. The *A. aegypti* is still present, for example, in many southern States of the United States. Perhaps not enough publicity has been given to the fact that the infested States have been officially reported by the United States Government to the World Health Organization as a yellow fever receptive area. The development in 1954 of yellow fever in Trinidad, an island heavily infested with the *A. aegypti*, and the northern extension of jungle yellow fever in Central America have been reminders that the insect vector must be eradicated from every area in the Americas if the threat of yellow fever is to be eliminated.

From the data on the principal causes of death and also from those on the 15 communicable diseases, the very great toll the communicable diseases are taking in the Americas is evident. The success that has been attained in regard to urban yellow fever and malaria indicates that eradication of malaria and the other diseases will depend on concerted efforts to apply existing knowledge and on determination to carry through such programs.

**Table 4. Malaria and whooping cough death rates per 100,000 population in 20 American countries, 1952**

Country	Malaria death rate	Whooping cough death rate
Argentina.....	0.0	1.4
Bolivia.....	64.1	13.9
Brazil <sup>1</sup> .....	7.5	6.3
Canada <sup>2</sup> .....	0.0	1.0
Chile.....	0.0	8.5
Colombia.....	23.9	34.6
Costa Rica.....	37.5	14.6
Dominican Republic.....	100.1	2.1
Ecuador <sup>3</sup> .....	16.9	9.8
El Salvador.....	71.9	10.9
Guatemala.....	233.5	199.0
Honduras.....	210.1	51.6
Mexico.....	80.8	32.5
Nicaragua.....	86.6	19.1
Panama.....	21.8	7.1
Paraguay <sup>4</sup> .....	14.5	8.7
Peru.....	18.7	89.9
United States.....	0.0	.3
Uruguay <sup>5</sup> .....	0.0	2.6
Venezuela <sup>6</sup> .....	2.5	15.3

<sup>1</sup> Federal District and State capitals, except city of São Paulo. <sup>2</sup> Excluding Yukon and Northwest Territories. <sup>3</sup> Capital cities of provinces. <sup>4</sup> For reporting area, 83 percent of population. <sup>5</sup> 1951. <sup>6</sup> Ill-defined causes proportionally distributed to defined causes.

### Status of Programs and Services

In addition to data on vital events and communicable diseases, data regarding the status of the various health programs being carried on, including disease control and environmental sanitation programs, were obtained in the reports on health conditions. To illustrate these data and to stress their value in program planning, an example is taken in the field of sanitation.

The fact that the diarrheal diseases were included among the 5 leading causes of death in 12 countries is evidence of the need for improvement in environmental sanitation. The data regarding the status of one of the programs in this field, the provision of water supply systems, for 13 countries are shown in table 5. In 5 of the 11 countries providing data for urban areas, three-fourths of the urban population was served by water supply systems in 1953—



Dominican Republic, El Salvador, Panama, United States, and Venezuela. In 5 others, more than half of the urban population had water supply systems. As would be expected, the percentages of the rural population having water supply systems were very low. Despite the obvious limitations of these data, they do point out the phases of water supply programs in which international help can be of greatest importance, and they serve to stimulate individual countries to raise standards to constantly higher levels.

**Table 5. Percentage of population served <sup>1</sup> by water supply systems in urban and rural areas in 13 American countries, 1953**

Country	Total	Urban	Rural
Argentina-----	43	67	2
Bolivia-----		57	-----
Canada-----	64	-----	-----
Chile-----		72	-----
Colombia-----	23	62	1
Dominican Republic-----	28	88	10
El Salvador-----		85	-----
Mexico-----	41	-----	-----
Nicaragua-----	9	27	0
Panama-----	52	75	37
Peru-----	30	60	10
United States-----	59	89	<sup>2</sup> 23
Venezuela-----		88	-----

<sup>1</sup> Percentages of population calculated using total population living in area.  
<sup>2</sup> Communities of less than 5,000 population with water supply systems.

Although some information was provided regarding the organization of health services and personnel employed, summarization of the ma-

terial for presentation here is difficult. In general, it can be said that the data indicated a shortage of trained personnel, an absence of full-time health departments, and the necessity for data to evaluate resources as well as needs for health services.

**Summary**

Selected data from reports of the American countries, which were prepared for the XIV Pan American Sanitary Conference, have been presented to illustrate existing knowledge regarding health conditions and health services. Shortcomings of the data are great, but the very act of providing the data that are available has been a powerful impetus to improved reporting as well as to improved health programs.

In most of the American countries, there is a need for emphasis on communicable disease control and eradication and on programs for the predominantly young population. National initiative, along with the coordinated efforts of international collaboration, can solve these problems, as it has others. Through full utilization of the basic data on health conditions that appear in the Summary of Reports of the Member States, 1950-53, the countries of the Western Hemisphere, working together, will now go forward in eradicating communicable diseases, developing environmental health programs, providing maternal and child health services, improving case reporting and vital statistics systems and basic data in other programs, and in the overall strengthening of health services.



*A psychologist concludes that more light would be shed by understanding human behavior factors than from complicated statistical analyses of the uncontrolled world surrounding accidents in everyday circumstances.*

## The Illusive Phenomena in Accident Proneness

By WILSE B. WEBB, Ph.D.

*How shall we determine the presence or extent of accident proneness?*

*Granted the factor of accident proneness, how shall we come to know its character?*

This, in a sense, will be a consumer's report—a report of occasionally desperate attempts to apply the cool logic of statistics to the fetid jungles of accident data. It is the result of some 5 years of delving into innumerable accident records (1-3). This faint blaze on my back tracks may help others avoid some of the moras-

ses in which I have floundered on a number of occasions.

### The Extent of Accident Proneness

In view of the wide use and frequent abuse of the term "accident proneness," it would appear to be a required first step that I outline my concept of its meaning.

I conceive of an accident as a condition of liability, as an event subject to and contingent upon the existence of identifiable, at least in a theoretical sense, events.

This position would contend that a constellation of circumstances at the time of an accident determines the occurrence of that accident. Further, the presence of certain events increases or decreases the probability of any given accident. The summation of the probabilities represents accident liability at any given time. Finally, the position maintains that a knowledge of all of the pertinent events prior to the accident permits the prediction that the accident will occur. It, of course, follows as a corollary that increasing knowledge about the factors surrounding an accident will permit its prediction, or, if such factors are manipulatable, will permit the reduction of accidents.

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Here is an expository categorization of events which may be called the dimensions of accident liability.

#### *Factors within individual:*

Stable individual characteristics (accident proneness). *Examples:* psychomotor capacities, intellectual capacities, sensory capacities.

Transitory individual characteristics. *Examples:* fatigue, illness, hangovers, emotional states.

Changeable individual characteristics. *Examples:* low level of training, faulty training.

#### *Factors outside individual:*

Stimulus presentation. *Examples:* clarity of cues for response, speed of cue presentation, sequence of cue presentation.

Response demands. *Examples:* speed of response, direction of response, accuracy of response.

Equipment adequacy. *Examples:* materiel failure, calibration errors, response lag.

Activities of others. *Examples:* faulty maintenance, faulty instruction.

Consider accident proneness as a component part of this accident liability. Accident proneness, in these conditions of accident liability, is that category concerned with the stable characteristics within the individual. The other categories obviously could not be considered as proneness on the part of the individual since they either are not stable or not directly under the control of the individual.

Accident proneness, then, may be defined as the continuing or consistent tendency of a person to have accidents as a result of his stable response tendencies. For example, two individuals may fly in the same aircraft and in identical circumstances. Thus, they would have the same situational probability of having an accident. However, one may be inherently a poor pilot in regard to coordinative capacities. He will have, because of this lack of proficiency, a greater probability of having an accident in circumstances requiring coordination. He would then be called an accident-prone pilot.

How may we detect the presence of accident proneness in a population of accidents? Let us recognize certain conditions inherent in our definition of accident proneness. First, it has been described as a continuing factor, and, second, it has been described as increasing the liability of accident occurrence. It follows, then, that, if a group of individuals with varying

amounts of accident proneness were exposed to conditions which permitted the operation of these factors of proneness, the accidents of those individuals with high accident proneness would exceed beyond chance expectancy the accidents of those with low accident proneness, other things being equal. The problem is simply one of establishing the fact that certain individuals had accidents which exceeded those expected on the basis of chance, other things being equal.

#### **The Poisson Method**

Perhaps the most classical method is the Poisson method (4, 5). The method reveals the statistical problem as a relatively simple one. Given a relatively infrequent event, how will these events be distributed by chance alone? If such a distribution can be derived, a comparison may be made with an obtained distribution of accidents. If the distributions differ, an inference about the operation of non-chance factors may be introduced.

Thus, if 100 accidents are going to be distributed by chance among 10,000 people over a period of 1 year, what are the chances of these accidents occurring to 100 different people as contrasted with some individuals having 2 accidents, some only 1, and some none; or, some individuals having as many as 3 or 4 accidents, some having 2, some having 1, and some having none? Given a chance distribution, how does it compare with the actual distribution of accidents under consideration?

Mathematically, the Poisson distribution, which is merely the binomial distribution with low probability of occurrence, can be used to describe the chance distribution of infrequent events. If the distribution of accident events deviates from that expected on the basis of the prediction of the Poisson distribution, we may state that a beyond-chance factor is operating. This technique has been so sharpened that we may actually estimate the amount of predictable variance which exists above and beyond chance and may further estimate a correlation which could be obtained between perfect predictors and this variance in excess of chance.

The accompanying table presents a mathematically derived chance distribution and an obtained distribution of 7,288 accidents occur-

ring to 17,952 Air Force pilots during an 8-year period (2). Let us consider this table.

#### According to the Poisson method

Number of accidents	Chance distribution		Obtained distribution	
	Number of pilots	Number of accidents of pilots	Number of pilots	Number of accidents of pilots
0-----	11,962	0	12,475	0
1-----	4,856	4,856	4,117	4,117
2-----	986	1,972	1,016	2,032
3-----	133	399	269	807
4-----	14	56	53	212
5-----	1	5	14	70
6-----	0	0	6	36
7-----	0	0	2	14

First, in regard to the chance distribution, if merely the repetition of an accident is to be taken as the definition of accident proneness, some 33 percent of the accidents could be so classified in a completely chance distribution. This is patently absurd.

Second, a casual comparison reveals that the obtained distribution contains individuals who did have accidents in excess of the distribution to be expected by chance. Only 1 pilot would have been expected to have had 5 accidents during this period on the basis of a chance distribution. In actuality, 14 had as many as 5 accidents. None would have been expected to have had 6 accidents if these accidents had been distributed on the basis of chance. In the obtained distribution some 6 individuals had as many as 6 accidents.

A comparison by the chi-square technique indicates the two distributions are significantly different. We must, however, reserve judgment as to the possibilities of inferring that this excess of chance occurrence can be attributed to accident proneness.

#### The Split-Period Method

Perhaps the most straightforward test of the consistency of accident tendencies over a period of time is the "split-period method." This is based on the determination of the relationship between a number of accidents had by indi-

viduals in 2 periods of time. The simplest method is to divide the total period of accident exposure into 2 halves and then determine if there is a relationship between the accidents had by individuals in the 2 periods. The statistical tool would be the correlation coefficient. In actual procedure, the time period is more typically divided into accidents occurring in odd and even periods in contrast to a first-half, last-half division so as to obtain better control of the external characteristics of the time periods.

A distribution of accidents on odd and even days, according to the split-period method, was obtained for the same Air Force population referred to previously. The obtained correlation is 0.107 and is correctable by a Spearman-Brown formula to 0.193 (2).

Since a correlation expresses the degree of relationship between two sets of measures, these figures indicate the degree to which the accidents had by a man during one period were related to the accidents he had in a second period. A correlation of 1.00 would indicate that the accidents during one period perfectly predicted the accidents in another period, or, one could infer there was a direct relationship between a man's accident behavior during the two periods of time. A 0.00 correlation would indicate that his accident behavior in the two periods was completely unrelated. The correlations obtained were small but significant, and it would be concluded that some beyond-chance factors were operative in the Air Force population.

It should be noted in passing that there has been, on occasion, differential touting of the Poisson method and the split-period method (6-8). It seems appropriate to point out that Jones and I (9) have shown that the two methods, derived from essentially independent assumptions, yield operationally identical estimates. We also found that mathematically the identity of the methods can be demonstrated. Practically, it would appear that the choice of the method becomes dependent only on convenience, ease of conceptualization, or personal preference.

#### External Correlation Method

A further statistical procedure establishing the presence of accident proneness may be la-

beled the "method of external correlation." This procedure would be dependent on the selection of a measure presumably related to accident proneness. The population would then be measured on this factor, and then these measures would be correlated against the accident occurrence. If this correlation was significant, it would indicate that accidents could be predicted on assumption of accident proneness, and, therefore, accident proneness could be inferred as existent. For example, suppose a measure of intelligence can be shown to be related to accident frequency. Since intelligence is a stable characteristic of the individual, it follows that accidents are to some extent a function of individual accident proneness as partially measured by intelligence.

### Limitations of Methods

All of these procedures have their difficulties, however. The prime difficulty lies in the fact that the beyond-chance factors which may be demonstrated by these methods may not be attributed to the existence of a continuing factor of accident proneness alone. A considerable portion of the liability conditions outlined previously may exist commonly with the individual but not be attributed to his own within-person proclivities for accidents.

For example, 2 individuals with precisely the same capacities or proneness potential may be assigned throughout the accident period to 2 different situations which require different complexities of response. The individual who is consistently required to respond more effectively is likely to make more errors, and accidents would be more frequent throughout the situation, and yet he could hardly be considered more accident prone—consistently more accident liable, yes, but not more accident prone. In fact, quite frequently the converse is true since better men are frequently assigned to more difficult situations. Or, again, frequency of exposure may be different for different individuals during the accident period. A man exposed twice as frequently as another man is likely to have more accidents, but again this could not be called accident proneness.

All instance variations in liability throughout the period under study will result in beyond-

chance distributions, if they are systematically associated with certain individuals and not with others. It follows that the extent to which all factors, other than the accident-prone factors which are included in the listing of the dimensions of liability, are equalized among the population under consideration defines the extent to which the deviation from chance established by the methods described can be attributed to accident proneness.

As a point of fact, with each increasing restriction on the Air Force population previously used, there was a reduction in the significance of deviation from chance. Until, for example, training accidents (which impose maximum restriction in regard to age, training, exposure, and type of aircraft) revealed no deviation in their accident repetition from that which would be expected by chance. The same holds true for selected groups of jet accidents in which exposure was largely equalized (2).

### The Clinical Method

One further method may be mentioned as a tool for probing the existence of accident proneness. It is not statistical, but may be described as the "clinical method," a method which involves very simply a post hoc detailed analysis of the characteristics of individual accidents and individual accident histories. If, for example, a man consistently has the same type of accident under varying circumstances, and these accidents may be attributed to some characteristic inherent in that man, at least these accidents and perhaps others are attributable to accident proneness.

The clinical method has its advantages and disadvantages, which have been, and are being, argued independent of the present problem. It yields no satisfactory estimate of the extent of accident proneness. I am somewhat frightened by the "seek and ye shall find" phenomena. In the typical complexity of the accident situation I can almost always find that which I am looking for if I know what I am looking for in the first place.

Perhaps the main advantage inherent in this procedure is the liveliness and convincing quality of the results and its usefulness in developing hypotheses to be further investigated.

## The Nature of Accident Proneness

Let us assume that either on the basis of faith or fact we are convinced a significant proportion of accidents is determined by accident proneness in a particular population. What do we do next? The mere pointing to the fact of accident proneness is hardly more useful than pointing to sin. We must somehow know its characteristics to be able to deal with it.

Our basic paradigm is not difficult to conceive. We need measures which are presumably related to this intervening concept of accident proneness. We need measures of the accident event. Finally, we need to determine whether our measures of accident proneness are related to or predictive of accidents.

Certain difficulties typically follow from the nature of accidents and accident records. The definition of the accident is a difficult one, yet this is a first requirement in a reasonable test of the predictability of our concepts concerning accident proneness. It is a bit absurd to suggest that, for example, an intelligence test could predict an accident resulting from the breakdown of equipment, when this breakdown was independent of the operations of the individual. In other words, we should limit ourselves to accidents for which the operator could at least theoretically be held responsible.

Unfortunately, even a simple dichotomy of accidents into personal responsibility and non-responsibility is frequently unreliable. When we further try to dimensionalize accidents within a personal responsibility category, vast confusion tends to reign. Not long ago, on reviewing psychological coding systems for accidents, DuBois and I found that the commonality of classification of the nature of the accident usually ranged from about 33 percent agreement between 2 raters to a maximum of about 70 percent agreement between the 2 raters (3). The variations seem to be primarily related more to the number of possible categories to which the accident could be assigned than to any descriptive nature of the codings used. So long as the definition of an accident is not at all clear—and to date I know of no satisfactory, psychologically meaningful dimensionalization of this event—our designs will be weak.

On the other end, there are many problems inherent in obtaining measures which we are to relate to this chaos. Most of the problems at this end stem from the fact that accidents are infrequent phenomena. This means that, if measures are to be collected prior to the occurrence of an accident, the data collection must be an extensive one. Frequently, as many as 10,000 measures must be obtained on a population in order to yield measures on 10 individuals who are going to have accidents. An alternative procedure is the measurement of a limited number of individuals and then waiting for the passage of an extensive period of time until the low probability of accidents yields sufficient cases. This procedure is further complicated on finding that the measures taken may be quite meaningless by the time the accident occurs. Then, there is the post hoc method, the method of obtaining data after the accident has occurred. This method contains all of the faults of a posteriori reasoning noted in the clinical method.

Although there are ways around these problems, one becomes discouraged. Faith, frustration, tolerance, or funds are necessary to sustain us through the travails involved. There is also, of course, the question of what measures should be used, which involves an appraisal of the state of psychology itself. I will merely understate the case by saying that much more needs to be known about the nature of man.

The most adequate studies of the role of psychological factors in the development of errorful behavior, in short, a study of accident proneness, will best be performed in the laboratory situation even though there are inherent difficulties in translating laboratory findings to the operating situation. However, I personally feel that these difficulties will be far less the difficulties inherent in the rough and ready analysis required of the present complexities of the uncontrolled world surrounding operational accidents.

## REFERENCES

- (1) Webb, W. B.: A study of records maintained by the Flying Safety Division and their usefulness for research purposes. Washington, D. C., United States Air Force, Flying Safety Division, 1949, p. 64.

- (2) Webb, W. B., and Jones, E. R.: Repeater pilot accidents in the United States Air Force. Report No. 30. Washington, D. C., United States Air Force, Air Research and Development Command, Human Resources Research Laboratory, 1952, p. 46.
- (3) Webb, W. B., and DuBois, P. H.: Personnel factors in aircraft accidents. Washington, D. C., United States Air Force, Air Research and Development Command, Human Factors Operational Research Laboratory, 1953, p. 54.
- (4) Cobb, P. W.: The limit of usefulness of accident rate as a measure of accident proneness. *J. Appl. Psychol.* 24: 154-159 (1940).
- (5) Newbold, E. M.: Practical application of the statistics of repeated events, particularly of industrial accidents. *J. Roy. Stat. Soc.* 90: 487 (1927).
- (6) Blum, M. L., and Mintz, A.: Correlation versus curve fitting in research on accident proneness: Reply to Maritz. *Psychol. Bull.* 48: 413-418 (1951).
- (7) Maritz, J. S.: On the validity of inferences shown from fitting of Poisson and negative binomial distributions to observed accident data. *Psychol. Bull.* 47: 434-443 (1950).
- (8) Mintz, A., and Blum, M. L.: An examination of the accident proneness concept. *J. Appl. Psychol.* 33: 195-211 (1949).
- (9) Webb, W. B., and Jones, E. R.: Some relations between two statistical approaches to accident proneness. *Psychol. Bull.* 50: 133-136 (1950).

## Nursing Home Project Approved

The first project to be constructed under the provisions of the Medical Facilities Survey and Construction Act of 1954 (P. L. 482, 84th Cong.) has been approved.

It is a 53-bed nursing home addition to the Pinal County General Hospital at Florence, Ariz., which will be used for nursing and medical care of the aged, and will be operated by the hospital.

At present, there are no nursing home facilities in the county, and patients who could be cared for in a nursing home are occupying more than 12 percent of the 86 beds in the general hospital. The nursing home will use the hospital's special services and personnel and will, when necessary, transfer patients to the hospital for medical or surgical treatment.

Estimated construction cost of the nursing home is \$240,000, toward which the Federal Government will contribute half and Pinal County the other half.

# Parasitism in Southeastern United States

## *a symposium*

The program of the Association of Southeastern Biologists, meeting in Charleston, S. C., April 21, 1955, included a symposium on parasite problems in the southeastern United States. The three papers of the symposium include a historical review by Dr. Faust, an appraisal of the progress made and the problem today by Dr. Wright, and a general summary of veterinary problems in parasitology by Dr. Bailey. The symposium moderator, Martin D. Young, Sc.D., director, Laboratory of Tropical Diseases, National Microbiological Institute, Public Health Service, Columbia, S. C., wrote the following introduction.

ABOUT three centuries ago the English successfully colonized the southeast coast of the United States. These colonists brought some exotic parasites, and later they imported slaves who also brought certain tropical parasites. In addition, the colonists encountered native parasites in the indigenous hosts. Confronted with a new set of epidemiological factors, the parasites behaved in different ways. Some became established to cause recurring epidemics. Others established endemic foci, of which some were to disappear gradually by attrition. Still other parasites were unable to maintain themselves in this area.

The parasites exerted a great influence upon the economic and social development of the people. Some of the more important para-

sitic diseases, such as malaria, were instrumental in causing the establishment of medical schools and influenced the type of culture evolved in the plantation low country, especially in the Carolinas. The investigation of hookworm disease emphasized the need for public health organizations and laid the foundation for the present-day county health systems.

Some of the parasitic diseases, namely malaria and filariasis, have virtually disappeared from this area. Others are still present. The symposium was held to review what has happened in the field of parasite problems in the southeastern United States and to estimate the current situation.

The eminent parasitologists in this symposium discuss their subjects authoritatively.



# History of Human Parasitic Infections

By ERNEST CARROL FAUST, Ph.D.

A RÉSUMÉ of human infections from parasitic organisms in the southeastern United States from the earliest records until recent times is logically divided into four periods: infections in the American Indian before the coming of the white man; from the earliest colonial period until about 1850; from 1850 until the end of the 19th century; and from 1900 until recent times.

## Before the Coming of the White Man

Very little is known about parasitic infections among the Indians. There is no indication that malaria was present (1), but by inference intestinal protozoiasis must have been relatively common since they have been found in all indigenous populations in regions where surveys have been made. The Indians must have had the common intestinal roundworms (*Ascaris* and *Trichocephalus*) for the removal of which the Cherokees employed crude oil of chenopodium, obtained from the seeds of the native plant *Chenopodium ambrosioides* var. *anthelminticum*, and possibly also the rhizomes of the pinkroot, *Spigelia marilandica* (2). Their dogs probably harbored *Ancylostoma braziliense* and possibly *Ancylostoma caninum*,

but the human hookworms are believed to have been introduced later from the Eastern Hemisphere.

When serious epidemics developed in Indian communities the inhabitants burned their homes and resettled on uncontaminated soil (3).

## From 1607 to 1850

During early colonial days the explorers and settlers who came from Europe brought with them the white man's common communicable diseases, notably smallpox, measles, and tuberculosis and, to a lesser extent, malaria and hookworm infection (*Ancylostoma duodenale*). Much of the parasitic diseases were those imported by African slaves, including virulent strains of vivax malaria, malignant malaria, the subtly developing quinine-resistant tropical hookworm infection, Bancroftian filariasis, schistosomiasis, and probably several other parasitic diseases indigenous to Africa. In the latter it may be reasonably assumed that relatively virulent strains of *Entamoeba histolytica* were introduced.

## Malaria

All three species of malaria require an appropriate mosquito host in the southeastern United States, and more prolifically as virgin soil for the cultivation of rice in the Carolinas and for sugar cane in the Louisiana country. The malaria-infected mosquito served as the reservoir for infection of the human. The mosquito in turn transmitted the

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parasites to other Negroes and to the white population. This situation caused rapid development of highly malarious communities. Later, with people settling in the fertile Ohio and Mississippi Valleys, malaria spread rapidly. By 1850 there were almost solid areas of intense malariousness from Baltimore south to Georgia, Alabama, and central Florida, inland to Cincinnati and St. Louis, and down to the Gulf of Mexico. From these highly endemic areas vivax malaria became established throughout almost the entire United States except for mountainous and desert regions, while the more tropical *falciparum* infection remained entrenched in the southeast (1).

### Hookworm Infection

Human hookworm infection caused by the more tropical parasite *Necator americanus* became gradually disseminated throughout the moist sandy humus soils of the southeast, extending from Virginia to southern Illinois and down to the gulf, and as far westward as eastern Texas. Here again the Negro was the source of the infection as he polluted the soil with his excreta which contained the eggs of the

After hatching and larval growth on the parasite was infective for all per-  
stepped barefooted on the infested  
soon hookworm infection was con-  
the white laborers in areas adjacent  
om lands.

ABOUT the most successful of the United States were from Florida and Louisiana in 1850, only a few years  
sites. (A. duodenale) from Italy and a  
fronted with before the tropical hookworm *N.*  
factors, the was specifically described.

### Other Infections

Other infections of the colonists and those who later emigrated  
ed inland from the Atlantic and gulf  
are familiar with the cosmopolitan in-  
roundworms. Some species, like the  
a *Enterobius vermicularis*, they brought

The people from Europe; others, like *Ascaris*  
the economic and *Trichocephalus trichiurus*,  
people may have acquired in part from the In-  
dians, and in larger part from the Negroes who  
worked on the plantations. The evidence sup-

porting these conclusions is indirect but rela-  
tively satisfactory, based on the descriptions of  
roundworms in the American medical texts of  
the late 18th and early 19th centuries and on the  
prescription of many native plants which were  
supposedly effective as intestinal vermifuges  
(5) and listed in the early editions of the United  
States Formulary (*Allium cepa*, *Allium sati-*  
*vum*, *Angelica archangelica*, *C. ambrosioides* var.  
*anthelminticum*, *Convolvulus jalapa*, *Ferula*  
*assafoetida*, *Juglans regia*, *Laurus camphora*,  
*Melia azedarach*, *Spigelia anthelmia*, *S. mari-*  
*landica*, *Tanacetum vulgare*, *Valeriana offi-*  
*cinalis*, and *Veratrum sabadilla*). Moreover,  
persons who ate inadequately cooked beef must  
have acquired beef tapeworm (*Taenia sagi-*  
*nata*) infection and, similarly, those who ate  
rare pork, infection with pork tapeworm  
(*Taenia solium*). Likewise, they probably be-  
came infected with *Trichinella spiralis*, which  
was first reported from hogs by Joseph Leidy  
of Philadelphia, in 1846.

Bancroft's filariasis, caused by *Wuchereria*  
*bancrofti*, was introduced in the African slaves  
(4) and became established in the domestic mos-  
quito *Culex quinquefasciatus* as a biological  
vector. However, there is no information dur-  
ing this period as to the geographic distribution  
or prevalence of this disease.

Blood fluke infections, caused by *Schistosoma*  
*mansonii* and *Schistosoma haematobium*, which  
were likewise introduced into the Western Hem-  
isphere in African slaves (4), failed to find suf-  
ficiently susceptible molluscan intermediate  
hosts in North America, never became estab-  
lished here, and did not survive the death of  
the human hosts who brought them into the  
country.

Primitive conditions for disposal of human  
excreta, contaminated water supplies, infre-  
quent bathing among the laboring and even  
other classes, and various other defects in per-  
sonal and community hygiene favored trans-  
mission and high prevalence of infections pro-  
duced by the intestinal protozoa. Yet there is  
no direct evidence of their presence or frequency  
although it seems justifiable to assume that a  
considerable amount of the common dysentery  
of these decades, referred to as "bloody flux,"  
was due to the pathogenic ameba, *E. histolytica*.

By 1850 most of the parasitic diseases of the southeast and those transmitted by arthropods or due to bacteria had reached their peak, had developed formidable plateaus of incidence, or were subject to serious periodic epidemics (3). At least two of our medical schools, the Medical College of South Carolina at Charleston and the Medical College of Louisiana, later named Tulane, at New Orleans, were established to train physicians to combat malaria, yellow fever, epidemic typhus fever, cholera, and endemic intestinal diseases.

Today it is readily understood that all of the environmental conditions which favor many of the infectious diseases were present during those decades in the southeastern States, namely (a) for malaria—newly cultivated, poorly drained land for the breeding of the anopheline mosquito vector; (b) for yellow fever—prevalence of *Aedes aegypti* transmitters in cisterns and other fresh water containers around the home; (c) for typhus fever—infrequent bathing and washing of clothes, resulting in body lice among both the poor classes and the socially elite; and (d) for the intestinal diseases—improper disposal of human excreta, contamination of food and drinking water, and carelessness in personal hygiene. While the slaves and poorer whites suffered most, the better educated and well-to-do persons were by no means exempt and at times had proportionately higher morbidity and mortality rates.

#### From 1850 to 1900

During the years 1862–65, when Northern soldiers were quartered in the South, there was a notable increase in malaria and dysentery, particularly in and around the Army camps. During this quadrennium the annual malaria morbidity rate in the Federal forces in North Carolina was 1,087 per 1,000 mean strength; in Tennessee, 848; and in the gulf area, 803 (6). Moreover, there were nearly 2 million reported cases of dysentery in the Northern Army, with 44,558 deaths attributed to this cause (3).

Following Appomattox, the South was deprived of its agricultural labor, the land remained untilled, and malaria mosquitoes bred without restraint (1). As late as 1881 the malaria death rate per 100,000 population was

428 in Shreveport, 318 in Vicksburg, 171 in Baton Rouge, 100 in New Orleans, and comparably high in other malarious areas of the southeast.

Epidemics of yellow fever of major or minor proportions were reported from one or more southern port cities annually from 1850 through 1900, except for 7 years—1861 (during blockade of southern ports by Federal forces), 1881, 1885, 1886, 1891, 1895, and 1896 (7). There were severe epidemics of dengue during 1849–60, 1873–76, 1880, and 1896–98. Between 1847 and 1853 there were about 1,200 cases of louse-borne typhus fever annually in the New Orleans Charity Hospital, originating from importation of the disease from Ireland and Mexico (8). Cholera arrived on boats from Europe. During 1849–53 and again in 1873, it caused heavy mortality at the port of New Orleans and was spread to communities far inland through the Mississippi, Ohio, Missouri, and Platte River Valleys (9).

#### From 1900 to 1950

The etiology and natural history of many of the common parasitic and arthropod-transmitted diseases prevalent in the southeast became known during the 1890's and the following decade. These included the role of *Anopheles* in the malaria life cycle, of *A. aegypti* in urban yellow fever, and of the body louse in epidemic typhus fever. As early as 1876, Manson had demonstrated that the household mosquito *C. quinquefasciatus* was an intermediate host and vector of Bancroft's filariasis (10). By 1900 the life cycle of the human hookworms was likewise a matter of record (11), but it was not until the 1920's that specific information was provided on the epidemiology and life cycle of *Ascaris*, as well as the etiology of cutaneous larva migrans.

#### *Amebiasis*

Although *E. histolytica* had been described by Lösch in 1875 and its pathogenic role in the production of disease was conclusively demonstrated during the next 25 years by workers in Europe, Egypt, Philadelphia, Baltimore, and Texas, its life cycle involving man was first directly demonstrated in 1913 when Walker and

Sellards in the Philippines fed cysts of this ameba to 20 human volunteers and obtained infection in 18, with dysenteric symptoms in 4 (12). Epidemiological surveys were begun in 1913 to determine the prevalence of, and methods of exposure to, amebiasis in different groups of the population in the United States, that is, urban vs. rural, clinic patients vs. apparently well persons, children vs. adults, and institutionalized vs. noninstitutionalized groups. These studies demonstrated a higher average incidence among noninstitutionalized individuals in the southeast than in other areas, due probably to less careful personal and group hygiene (13).

### *Malaria*

The first two decades of the 20th century saw considerable retreat of malaria along the northern border of the hyperendemic areas in the southeast, primarily as a result of better drainage of farmland. In contrast, there was no appreciable decrease in malariousness in the southeast (14). During the depression of the 1930's there were notable increases in morbidity and mortality from malaria in this area. Then widescale control was instituted by cooperation of Federal and State public health agencies, consisting of scientific drainage and other antilarval measures, screening of homes, chemotherapy, and more adequate diets among the poorer classes in the population.

Beginning in 1942 malaria vector control was carried out intensively within and around military training bases in the southeast, and, as soon as DDT was in supply, this insecticide was used effectively both as a larvicide (15) and an imagocide. More accurate blood film diagnosis of the malaria parasites so that malaria and typhoid fever were no longer confused (16), together with treatment of human carriers with quinacrine and later with chloroquine, practically terminated the chances for the remaining anophelines to pick up the infection and transmit it to other persons.

Although our local *A. quadrimaculatus* was shown to be readily susceptible to foreign strains of human plasmodia (17), as a result of effective control measures only a very few incidental transmission cycles developed in the United States following the return of many thousands

of American troops from malarious areas during World War II, and more recently from Korea. Thus, by 1950 malaria had ceased to be a public health problem in any previously malarious area in the United States (18).

### *Hookworm Infection*

Soon after the discovery and naming of the hookworm *N. americanus* in 1902 by Charles Wardell Stiles, surveys were undertaken to ascertain the clinical and public health importance of hookworm infection in the southeastern United States. It was discovered that this parasite had extensive distribution, especially in the nonmountainous areas, and was responsible for much serious illness, an appreciable number of deaths, and untold economic loss.

In 1915 the Rockefeller Foundation undertook studies in the southeast to obtain more exact epidemiological information, with the objective of developing effective control (19). In cooperation with State public health agencies all of the endemic areas were surveyed, after which anthelmintic treatment was administered to the hundreds of thousands of infected individuals (20). Sanitary methods for disposal of human excreta were instituted, and education concerning hookworm epidemiology and its prevention became a part of the public health programs of all communities in which the disease was prevalent.

These measures were successful in reducing the heavy hookworm burden in all but a few localities (21) although incidental hookworm infection remained throughout much of the previously heavily endemic area (22).

### *Cutaneous Larva Migrants*

The disease, cutaneous larva migrans or creeping eruption, is restricted mostly to the South Atlantic and the gulf coasts, particularly on both coasts of northern Florida. Clinical and experimental studies of Kirby-Smith and associates between 1917 and 1927 demonstrated that the etiological agent is a non-human strain of *A. braziliense*, exposure to which occurs when persons lie on beaches or otherwise come in contact with the infective-stage larvae in places where dogs or cats harboring the adult worms have previously defecated (23).

## Ascariasis

Inquiry into the geographic distribution and epidemiology of ascariasis was undertaken in 1927 by Cort and his associates, a few years after the life cycle of the etiological agent, *A. lumbricoides*, had been elucidated by Ransom and his associates (24, 25). It was found that in the southeastern United States this was fundamentally an infection of young children, who seeded the dooryard with *Ascaris* eggs (26). Later, the same children and their playmates became infected by getting the embryonated eggs in their mouths—eating contaminated soil on play objects or fingers and then swallowing the eggs. With a few notable exceptions, ascariasis in the southeast was found to be predominantly prevalent in the southern extensions of the Appalachian highlands. Headlee (27), who studied the epidemiology of ascariasis in New Orleans, emphasized that it is primarily a familial infection. Up to 1950 no sustained or extensive programs had been undertaken to control this infection.

## Visceral Larva Migrants

The dog ascarid, *Toxocara canis*, has been found to produce a serious childhood disease designated as visceral larva migrans. When a child swallows fully embryonated eggs of this parasite, the eggs hatch in the child's duodenum and undertake a lung journey, just as occurs in human *Ascaris* infection. However, since man is not a particularly suitable host for the dog ascarid, granulomatous tissue reaction almost invariably traps the migrating larvae, most frequently in the liver, but at times in other organs and tissues. A pronounced sensitization reaction results, with prolonged high eosinophilia. The infection is incapacitating but not usually fatal. Discovery of the etiology of this disease (in New Orleans) has been so recent that its prevalence and geographic extent are essentially undetermined (28).

## Strongyloidiasis

*Strongyloides stercoralis* is prevalent in warm moist climates; in the United States it occurs mostly in the gulf coast areas where there is a relatively high ground water level, as in the bayou country of Louisiana (29); elsewhere throughout most of the southeast the infec-

tion is relatively sporadic. This nematode is biologically interesting since under favorable conditions it can carry out one or more complete life cycles as a free-living organism on the soil, while at other times it propagates exclusively by internal autoinfection (30).

## Whipworm Infection

In connection with epidemiological studies on hookworm and *Ascaris*, infection with the whipworm, *T. trichiurus*, has been found to be widely disseminated in the southeast (31, 32). Most reports indicate that the average worm burden is relatively light, but young patients living in unsanitary rural environments occasionally have a high worm burden, with dysentery and other manifestations of severe colitis.

## Enterobiasis

Infection with the pinworm, *E. vermicularis*, is common in children throughout the southeast, but is no more prevalent here than it is in cooler climates. The development of the NIH swab (cellophane) and more recently of the Graham swab (scotch tape) for recovery of the eggs deposited by the female worms migrating outside the anus, has provided much easier and more accurate diagnosis than fecal examination for eggs (32). In our area as elsewhere the infection is primarily familial or institutional.

## Trichinosis

Surveys to determine the incidence of human infection with *T. spiralis* have been conducted in several localities in the southeast, usually employing digestion or pressed muscle examination of routine necropsies to demonstrate the larval stage. The percentage of positive cases has been relatively low (2.8 to 10.0) save for one report of 33.0 from Alabama. With few exceptions the larval count per gram of infected muscle has likewise been low (33, 34). This corresponds to the clinical findings in the southeast where the infection rarely produces severe manifestations.

## Tapeworm Infections

The beef tapeworm, *T. saginata*, has become considerably less prevalent than it was 25 years ago, and the pork tapeworm, *T. solium*, has

practically disappeared from the native population of the United States. In contrast, both of these infections are increasingly common in continental Latin America.

The dwarf tapeworm, *Hymenolepis nana*, which requires no intermediate host and results from poor personal hygiene and lack of environmental sanitation, is widely distributed in the southeast and is most often found in children (35). Occasionally patients are so heavily parasitized that they are seriously ill as a result of these worms.

Human infection with the fish tapeworm, *Diphyllobothrium latum*, has been demonstrated to be indigenous in only one locality in the southeast, a rural community in Florida, where Negro boys and their dogs harbor the adult worms (36). The larval stage (sparganum) of a related tapeworm, *Diphyllobothrium mansonii* complex, producing somatic infection in man (sparganosis) has been reported in earlier decades—once from Florida and once from Texas. Recently, eight new cases have been discovered in Louisiana, Mississippi, and eastern Texas. As in fish tapeworm infection, species of *Cyclops* are the first intermediate host of the parasite, while frogs, snakes, birds, and mammals, but never fishes, are the second larval-stage hosts, and cats or dogs are the natural definitive hosts of this tapeworm. There is no specific evidence as to how man acquires the infection, but it seems likely from the case histories that he drank unfiltered water containing infected *Cyclops*.

Hydatid disease, produced by the larval stage of *Echinococcus granulosus*, has been demonstrated to be an autochthonous human infection in Virginia, Tennessee, Mississippi, and Louisiana.

### *Filariasis*

During the 18th and 19th centuries Bancroft's filariasis may have been widely distributed throughout the southeast although there is no authentic record of the demonstration of the etiological agent, *W. bancrofti*. Charleston, S. C., was found to be an endemic center during blood surveys conducted in 1886, 1890, and 1915. Between 1915 and 1918 Edward Francis of the Public Health Service examined human blood films in 10 southern cities

(Charleston, Columbia, Beaufort, and Georgetown, S. C.; Savannah and Milledgeville, Ga.; Jacksonville and Tampa, Fla.; Mobile, Ala.; and New Orleans, La.) to determine the extent of the infection. Only in Charleston were positive individuals discovered (13 to 35 percent of inmates of the old folks' home) who had maintained residence exclusively in the United States.

Since the publication of Francis' report (37), the writer has learned of only one authentic diagnosis of an autochthonous case—in 1930 in a native of Georgia who was for a time a patient of the Public Health Service Hospital at Carville, La. The lack of any subsequent reliable reports of cases suggests that Bancroft's filariasis has disappeared from the southeast. Meanwhile there have been three recent findings of immature female filariae from subcutaneous nodules of white persons with long residence in Florida. While these worms conform to the criteria for *Dirofilaria conjunctivae*, it seems reasonable to believe that they are in reality young specimens of the dog filaria, *Dirofilaria immitis*, which were unable to complete their development in man (38).

### Summary and Conclusions

The parasite problems of the southeastern United States have been presented from the perspective of history and epidemiology. Some of the common intestinal roundworms and probably most of the intestinal protozoa were indigenous in the American Indian. Other animal parasites were introduced from Europe by the explorers and colonists although diseases among them were relatively unimportant compared with the contagious diseases of viral and bacterial origin which were brought to the Americas. Many serious problems developed with the importation of slaves from Africa and the consequent propagation in the favorable environment of the southeast of tropical strains of malaria parasites and the hookworm *Necator americanus*. As families from the Atlantic and gulf coast areas settled in the fertile inland valleys, these and other parasitic diseases became more extensively distributed. Poor conditions of sanitation and primitive personal hygiene made of the entire southeast a hyperen-

demic area for a number of diseases of parasitic origin, of others transmitted by arthropods, and those caused by enteric bacteria.

With the discovery of the etiological agents and knowledge of their life cycles and their methods of transmission, came improvement in water supplies, drainage, and disposal of human excreta. Public health programs were instituted to control these diseases. Parasite control in the southeast presents less of a problem now than it did in 1850 or 1900.

#### REFERENCES

- (1) Boyd, M. F.: An historical sketch of the prevalence of malaria in North America. *Am. J. Trop. Med.* 21: 223-244, January 1941.
- (2) Faust, E. C.: Human helminthology. A manual for physicians, sanitarians, and medical zoologists. Ed. 3. Philadelphia, Lea and Febiger, 1949, p. 644.
- (3) Hirsch, A.: Handbook of geographical and historical pathology. London, New Sydenham Society, 1883, vol. 1, pp. 197-315.
- (4) Scott, H. H.: Presidential address: The influence of the slave trade in the spread of tropical disease. *Tr. Roy. Soc. Trop. Med. & Hyg.* 37: 169-188, December 1943.
- (5) Barton, B. S.: Collections for an essay towards a materia medica of the United States. Ed. 2. Philadelphia, A. and G. Way, 1801, part 1, pp. 38-60.
- (6) Sternberg, G. M.: Malaria and malarial diseases. New York, W. Wood, 1884, 329 pp.
- (7) Angustin, G.: History of yellow fever. New Orleans, Searcy and Pfaff, 1909, 1,194 pp.
- (8) Hinman, E. H.: History of typhus fever in Louisiana. *Am. J. Pub. Health* 26: 1117-1124, November 1936.
- (9) Wendt, E. C.: A treatise on Asiatic cholera. New York, W. Wood, 1885, 403 pp.
- (10) Manson, P.: Further observations on *Filaria sanguinis-hominis*. *China Imperial Customs M. Rep.* 3: 1-26 (1878).
- (11) Looss, A.: Die Wanderung der Ankylostorum und Strongyloides-Larven von der Haut nach dem Darm. *Compt. rend. Congres internat. de zool.* [Berne] 6: 225-233 (1905).
- (12) Craig, C. F.: Amebiasis and amebic dysentery. Springfield, Ill., Thomas, 1934, 315 pp.
- (13) Faust, E. C.: The prevalence of amebiasis in the Western Hemisphere. *Am. J. Trop. Med.* 22: 93-105, January 1942.
- (14) Maxcy, K. F.: The distribution of malaria in the United States as indicated by mortality reports. *Pub. Health Rep.* 38: 1125-1138, May 25, 1923.
- (15) Ferguson, F. F., Upholt, W. M., and Simmons, S. W.: A summary of the experimental use of DDT as a mosquito larvicide. *J. Nat. Malaria Soc.* 8: 32-49, March 1949.
- (16) Dock, G.: Typho-malarial fever, so-called. *New York M. J.* 69: 253-258, April 1899.
- (17) Young, M. D., Stubbs, T. H., Ellis, J. M., Burgess, R. W., and Eyles, D. E.: Studies on imported malarias. 4. The infectivity of malarias of foreign origin to anophelines of the southern United States. *Am. J. Hyg.* 43: 326-341, May 1946.
- (18) Andrews, J. M., and Gilbertson, W. E.: Blueprint for malaria eradication in the United States. *J. Nat. Malaria Soc.* 7: 156-170, September 1948.
- (19) Cort, W. W., and others: Investigations on the control of hookworm disease. *Am. J. Hyg.* 1: 557-568 (1921); 2: 1-25, 107-187 (1922); 3: 280-295, 315-338 (1923); 4: 213-221 (1924); 5: 49-89 (1925).
- (20) Darling, S. T.: The hookworm index and mass treatment. *Am. J. Trop. Med.* 2: 397-447, April 1922.
- (21) Andrews, J.: Modern views on the treatment and prevention of hookworm disease. *Ann. Int. Med.* 17: 891-901, December 1942.
- (22) Keller, A. E., Leathers, W. S., and Densen, P. M.: Result of recent studies of hookworm in eight southern States. *Am. J. Trop. Med.* 20: 493-509, July 1940.
- (23) Kirby-Smith, J. L., Dove, W. E., and White, G. F.: Creeping eruption. *Arch. Derm. & Syph.* 13: 137-173, September 1926.
- (24) Ransom, B. H., and Foster, W. D.: Life history of *Ascaris lumbricoides* and related forms. *J. Agri. Res.* 11: 395-398 (1917).
- (25) Ransom, B. H., and Cram, E. B.: The course of migration of *Ascaris* larvae. *Am. J. Trop. Med.* 1: 129-156, October 1921.
- (26) Cort, W. W.: Recent investigations on the epidemiology of human ascariasis. *J. Parasitol.* 17: 121-144 (1931).
- (27) Headlee, W. H.: The epidemiology of human ascariasis in the metropolitan area of New Orleans, Louisiana. *Am. J. Hyg.* 24: 479-521, November 1936.
- (28) Beaver, P. C., Snyder, C. H., Carrera, G. M., Dent, J. H., and Lafferty, J. W.: Chronic eosinophilia due to visceral larva migrans. Report of three cases. *Pediatrics* 9: 7-19, January 1952.
- (29) Jones, C. A.: Clinical studies in human strongyloidiasis. I. Semiology. *Gastroenterology* 16: 743-756, December 1950.
- (30) Faust, E. C., and DeGroot, A.: Internal auto-infection in strongyloidiasis. *Am. J. Trop. Med.* 20: 359-375, May 1940.
- (31) Otto, G. F.: *Ascaris* and *Trichuris* in southern United States. *J. Parasitol.* 18: 200-208 (1932).



- (32) Jacobs, A. H.: Entrobiasis in children: Incidence, symptomatology, and diagnosis, with a simplified scotch cellulose tape technique. *J. Pediat.* 21: 497-503, October 1942.
- (33) Sawitz, W.: Prevalence of trichinosis in the United States. *Pub. Health Rep.* 53: 365-383, Feb. 12, 1938.
- (34) Wright, W. H., Kerr, K. B., and Jacobs, L.: Studies on trichinosis. XV. Summary of finding of *Trichinella spiralis* in random samplings and other samplings of the population of the United States. *Pub. Health Rep.* 58: 1293-1313, Aug. 27, 1943.
- (35) Chandler, A. C.: Species of *Hymenolepis* as human parasites. *J. A. M. A.* 78: 636-639, Mar. 4, 1922.
- (36) Hood, M.: *Diphyllobothrium* infection in Florida. *J. Parasitol.* 34: 72 (1948).
- (37) Francis, E.: Filariasis in southern United States. Hygienic Laboratory Bull. No. 117. Washington, D. C., U. S. Government Printing Office, 1919, 34 pp.
- (38) Faust, E. C., Agosin, M. Garcia-Laverde, A., Sayad, W. X., Johnson, V. M., and Murray, N. A.: Unusual findings of filarial infections in man. *Am. J. Trop. Med. & Hyg.* 1: 239-249, March 1952.
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EDITOR'S NOTE: The term, "*Trichoccephalus trichiurus*," used in the above paper is synonymous with the term, "*Trichuris trichiura*," in the other papers of this symposium.

## Special Committee on Medical Research

A Special Committee on Medical Research has been named by the National Science Foundation to review and evaluate the medical research program of the Department of Health, Education, and Welfare.

In requesting the review, the Secretary of Health, Education, and Welfare asked that the committee consider the rate of growth of the Department's health, medical, and related research program in the light of Federal responsibilities and appraise its present level of medical research support. Careful consideration was also requested of the proper balance of support for basic and applied research and the relative distribution of effort among the major special fields of health research.

The special committee is headed by Dr. C. N. H. Long, chairman, department of physiology, Yale University School of Medicine. Other members are Dr. E. A. Doisy, professor of biochemistry, St. Louis University School of Medicine; Dr. Ernest W. Goodpasture, Armed Forces Institute of Pathology, Walter Reed Army Medical Center; Dr. A. B. Hastings, department of biological chemistry, Harvard Medical School; Dr. Charles Huggins, director, the Ben May laboratory for cancer research, University of Chicago; Dr. Colin M. MacLeod, department of microbiology, New York University School of Medicine; Dr. C. Phillip Miller, department of medicine, University of Chicago; Dr. W. M. Stanley, director, virus laboratory, University of California. Dr. Joseph W. Pisani, on leave of absence from the State University College of Medicine at New York City, where he is assistant dean, is serving as executive secretary of the committee.



# Current Status of Parasitic Diseases

By WILLARD H. WRIGHT, Ph.D.

THE past few decades have witnessed a remarkable advance in public health standards in the southeastern United States, and along with this advance changes have been recorded in the incidence of most parasitic infections. Other than the virtual disappearance of malaria, to which the insecticide DDT has contributed in no small measure, most of the gains have not been associated with any spectacular medical discovery.

The decline in hookworm disease is a case in point. Stiles (1), who awakened the consciousness of the south concerning this disease and who was responsible for much of the early control effort, believed that the important factors in the decline in hookworm disease were associated with the advent of the automobile, good roads, better schools, industrial expansion, higher economic status, and improved sanitation. These factors are even more potent influences today than they were more than two decades ago. Regardless of the responsible elements or the operative mechanism, it is interesting to trace the changes since 1910 and to analyze the present status of human parasitic infections in this area through such data as are available.

## Sources of the Data

The more recent information concerning the incidence of intestinal helminths has been

placed at my disposal by the directors of the State health department laboratories or other State officials. The data for 1930-38 have been taken from the extensive surveys conducted by the department of preventive medicine of Vanderbilt University School of Medicine and summarized by Keller, Leathers, and Densen (2). The figures for 1910-14 are from the reports of the Rockefeller Sanitary Commission. In certain instances, material has been abstracted from reports of State health officers.

Morbidity data on amebiasis and trichinosis have been extracted from records of the National Office of Vital Statistics, Public Health Service. Information concerning the incidence of *Trichinella spiralis* represents a summary of all diaphragm examinations reported by various investigators. The material covering malaria morbidity and cases appraised during 1948-53 was compiled by the Communicable Disease Center, Public Health Service.

The validity of some of the comparisons made in this paper is subject to question because of many variable factors. The surveys were made by many different individuals and different techniques were utilized. There is no certainty that the samplings came from the same areas in the various States or that similar population groups are represented. Regardless of these limitations, a comparative presentation of data for various periods is warranted, and in many cases the comparisons are of considerable significance.

## *Ascaris lumbricoides*

The classic report of Otto and Cort (3) summarized the information regarding the dis-

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tribution of *Ascaris lumbricoides* infections in the United States up to 1934. The high incidence areas were defined by these authors as the southern Appalachian plateau with its foothills and contiguous valleys, isolated areas in the coastal region of North and South Carolina, and areas in Florida, Arkansas, and central and south Louisiana. The highest incidences recorded have been from the mountainous regions of Kentucky, Virginia, and Tennessee.

The latest available data on the incidence of *A. lumbricoides* infections in certain southeastern States are summarized in table 1. The figure for Kentucky is strikingly higher than that for any other State, and Florida and Louisiana follow in order. These figures are then consonant for the most part with the summation of Otto and Cort 20 years ago.

A comparison between the recent incidence of ascariasis in various southeastern States and the data for 1929-38 also appear in table 1. The data indicate a decided improvement in the situation with regard to this parasite except in Florida, which now shows a higher incidence than that reported for 1937-38.

#### Zoonotic Larval Ascariasis

Zoonotic larval ascariasis is also known as visceral larva migrans. During recent years a number of reports, some from the southeast, of a clinical syndrome associated with hepatomegaly and pathological foci in the liver believed to be due to invasion by ascarid larvae

have appeared. In most cases an intermittent fever is present. There is usually a history of nausea, vomiting, anorexia, irritability, cough, and loss of weight. In cases with pulmonary involvement, roentgenograms may show transitory, shadowy infiltration. There is marked anemia, a striking leukocytosis, and a high eosinophilia. Liver function tests frequently show deviation from the normal. In cases in which laparotomy has been performed, the liver has been found to be studded with white plaques of scar tissue.

Perlingiero and György (4), Zuelzer and Apt (5), Mercer and associates (6), and Behrer (7) were the first to describe these cases, which have occurred mainly in young children. Most of these authors associated the condition with larvae of *A. lumbricoides*. However, Beaver and associates (8) were of the opinion that the three observed by them were due to the larvae of *Toxocara canis*, the most common of the two species of ascarids infecting the dog. Since that time, the larvae of the cat ascarid, *Toxocara cati*, have also been incriminated.

Wright (9) showed that the life cycle of *T. canis* is similar to that of *A. lumbricoides*. However, in abnormal hosts the larvae have a pronounced tendency to wander extensively in various tissues without necessarily completing the entire life cycle. According to Mendheim, Scheid, and Schmidt (10), the adult cat ascarid, *T. cati*, has been found 18 times in man, but only 1 authentic case involving a mature infection with the dog ascarid, *T. canis*, is on rec-

Table 1. Comparison of recent and prior data concerning the incidence of infections due to *Ascaris lumbricoides* in 9 southeastern States

State	Recent period <sup>1</sup>	Total examinations	Percent positive	Former period	Total examinations	Percent positive
Alabama.....	1953-54	83,901	0.4	1934-37	253,630	1.1
Florida.....	do.....	163,479	7.8	1937-38	33,185	2.5
Georgia.....	do.....	170,856	2.1	1935-36	63,316	1.3
Kentucky.....	do.....	5,756	21.1	1934-35	<sup>2</sup> 23,964	34.7
Louisiana.....	do.....	128,343	4.4			
Mississippi.....	1951-54	85,362	.9	1932-33	50,733	1.1
North Carolina.....	1953-54	36,480	2.6	1935-37	43,647	11.4
South Carolina.....	1951-54	25,239	3.8	1934-35	<sup>3</sup> 28,875	4.0
Tennessee.....	1950-54	23,529	2.7	1929-31	31,999	27.1

<sup>1</sup> As revealed by State health department laboratory examinations. Report, 1935-36.

<sup>3</sup> White only.

<sup>2</sup> Georgia State Board of Health Biennial

Table 2. Incidence of infections due to *Trichuris trichiura* in 9 southeastern States as revealed by recent and prior surveys

State	Period	Total examinations	Number positive	Percent positive	1930-38 Percent positive
Alabama	1951-52	40,845	13	0.03	0.04
Florida	1953-54	163,479	1,441	.9	.4
Georgia	do	170,856	513	.3	.3
Kentucky	do	5,756	217	3.8	10.0
Louisiana	do	128,343	5,562	4.3	
Mississippi	1951-54	85,362	499	.6	.3
North Carolina	1953-54	36,480	75	.2	.9
South Carolina	1951-54	25,239			.04
Tennessee	1950-54	23,529	197	.8	7.6

ord for man. Regardless of the fact that these worms seldom develop to maturity in man, children especially are no doubt often exposed to the infective ova. The potential exposure must be considerable since it has been estimated that there are in the United States some 22 million pet dogs and 11 million domestic cats, the majority of which at one time or another probably become infected with *Toxocara*.

Although perhaps not directly related to zoonotic larval ascariasis, the cases of nematode endophthalmitis reported by Wilder (11) present another indictment against nematode larvae as disease agents. Wilder reported 46 cases in which nematode larvae were found in 24 of the enucleated eyes and a characteristic reaction in the other 22. With few exceptions, the 46 patients were children, the greatest number being from the southeast. While Chitwood identified the larvae as hookworm larvae, recent findings concerning conditions due to *Toxocara* larvae would leave the suspicion that perhaps these larvae are involved in cases of endophthalmitis.

### *Trichuris trichiura*

While the general factors responsible for the transmission of *A. lumbricoides* are applicable to *Trichuris trichiura*, the ova of the latter have a much higher moisture requirement for their development and are less resistant to desiccation (12). The incidence of *T. trichiura* infection is usually higher in tropical and subtropical areas with heavy rainfall than in the temperate zones, where conditions in the ex-

ternal environment are less favorable for the ova. Even in the mountains of Kentucky, where conditions were once extremely favorable for transmission of both parasites, Keller and Leathers (13) obtained an incidence of 40.8 percent for *A. lumbricoides* and an incidence of only 12.1 percent for *T. trichiura* infections. Recent data concerning the occurrence of the latter parasite in certain southeastern States and data for 1930-38 are shown in table 2. Relatively low indexes were recorded in all States represented, with the highest recent incidence in Louisiana. The relatively heavy rainfall and high humidity in parts of Louisiana may provide favorable conditions for the development of the ova of this parasite.

### Hookworm Infection

At one time hookworm disease constituted a serious public health problem in the southeast and was responsible for much physical and mental retardation. The current incidence is relatively low (table 3). Florida shows the highest incidence of all southeastern States represented, followed in immediate order by Georgia, North Carolina, and Alabama. The marked reduction which has taken place in the incidence of hookworm infection since 1910-14, the days of the Rockefeller Sanitary Commission and since the survey conducted by Vanderbilt University in the 1930's is shown in table 4. It is not possible to arrive at any definitive evaluation concerning changes in the intensity of the infection over the past 40 years because efforts to ascertain the relative worm burden

were not made during the 1910-14 surveys nor are such data available for the recent period. However, the available evidence would indicate that there has been over the period in question a marked reduction in the worm burden. Keller, Leathers, and Densen (2) found that about one-fourth of the individuals in their 1930-38 surveys had infections sufficiently severe to produce clinical symptoms. Hood (14) stated that in Florida there had been a

**Table 3. Incidence of hookworm infection in 9 southeastern States as revealed by examinations by State health department laboratories**

State	Period	Number of examinations	Number positive	Percent positive
Alabama-----	1953-54	83,901	9,936	11.8
Florida-----	do-----	163,479	30,844	18.9
Georgia-----	do-----	170,856	29,231	17.1
Kentucky-----	do-----	5,756	217	3.8
Louisiana-----	do-----	128,343	5,106	4.0
Mississippi-----	1951-54	85,362	5,406	6.3
North Carolina-----	1953-54	36,480	4,665	12.8
South Carolina-----	1951-54	25,239	2,022	8.0
Tennessee-----	1950-54	23,529	460	2.0

marked diminution in the intensity of infection during the 10 years previous, and noted that in western Florida only 7.7 percent of infected children had moderate to heavy infections. Hosty and co-workers (15) stated that in Alabama the typical clinical case is rarely seen.

### Creeping Eruption

Creeping eruption is an annoying but not a serious condition caused by the migration, through the skin, of infective larvae of the dog and cat hookworm, *Ancylostoma braziliense*. It occasionally comes to maturity in man in certain parts of the tropics. The condition is associated with papular formation and tortuous or serpiginous, subepithelial burrows with later vesiculation. The larvae may continue to migrate for weeks or months. Infection is contracted when parts of the body come in contact, with infested soil.

Since creeping eruption is not a reportable disease, the frequency of its occurrence is not known. However, physicians along the south

Atlantic and gulf coasts are called upon to treat many cases annually. In 1949 Donaldson, Steele, and Scatterday (16) sent questionnaires to 1,100 Florida physicians, of whom approximately 50 percent replied. These physicians had seen, within a 6-month period, more than 8,000 cases of the disease. These authors conducted surveys of hookworm infection in dogs and cats in Florida; of 495 dogs examined 44.2 percent were infected with *A. braziliense*. Seven of 26 cats were positive. Of the 495 dogs, 86.1 percent carried one or both hookworm species, *A. braziliense* and *Ancylostoma caninum*. The larvae of the latter species may also be involved in the causation of creeping eruption. The opportunities for exposure to dog and cat hookworm larvae would seem to be exceptionally good, particularly along the Atlantic and gulf beaches.

### Amebiasis

In 1950, Wright reported on the public health status of amebiasis in the United States and pointed out the factors which account for a considerable variability in reporting (17). Because of these factors, there is some question whether morbidity reports accurately reflect the occurrence of the disease. At that time it was pointed out that amebiasis was more prevalent in the West South Central States, Arkansas, Louisiana, Oklahoma, and Texas, than in any other part of the United States. There was also evidence that the disease was more widespread in the southern States as a

**Table 4. Comparison of recent and prior data on the incidence of hookworm infection by percentage found positive in 8 southeastern States**

State	1910-14 <sup>1</sup>	1930-38 <sup>2</sup>	1950-54 <sup>3</sup>
Alabama-----	41.0	17.7	11.8
Florida-----	61.8	34.8	18.9
Georgia-----	65.2	31.6	17.1
Kentucky-----	37.4	8.5	3.8
Mississippi-----	53.0	19.6	6.3
North Carolina-----	36.6	12.3	12.8
South Carolina-----	37.3	24.8	8.0
Tennessee-----	25.4	6.8	2.0

<sup>1</sup> Rockefeller Sanitary Commission surveys. <sup>2</sup> Reference 2. <sup>3</sup> State health department laboratories. For exact dates of survey, see table 3.

Table 5. Reports of cases of amebiasis in 10 southeastern States for various years

State	Number of cases					
	1933	1940	1950	1951	1952	1953
Alabama	8	6	45	31	18	46
Florida	33	37	113	88	161	177
Georgia	70	99	37	15	18	21
Kentucky	0	10	33	0	7	0
Louisiana	41	43	339	155	124	85
Mississippi	892	1,797	121	177	92	81
North Carolina	N. N.	N. N.	132	96	44	31
South Carolina	1	6	6	0	4	4
Tennessee	11	23	102	90	144	60
Virginia	14	11	10	4	8	20
Total	1,070	2,032	938	656	620	525

N. N.=Not notifiable.

Table 6. Surveys for *Entamoeba histolytica* in various population groups in certain southeastern States prior to 1945

Survey group	Number examined	Number positive	Percent positive	Date	Locality	Author
<i>Inpatients and outpatients</i>						
Private patients	1,003	55	5.5	1933	Atlanta, Ga.	Dougherty.
Clinic patients	1,100	158	14.4	1934	New Orleans, La.	Faust.
Do	4,270	355	8.3	1936	do	Faust and Headlee.
Outpatients	2,265	77	3.4	1939	do	Moss.
Patients with colonic symptoms.	236	68	28.8	1943	do	D'Antoni.
Total	8,874	713	8.0			
<i>General population</i>						
Rural population	460	92	20.0	1930	Virginia	Faust.
Do	4,987	861	17.3	1930	Tennessee	Meleney.
Do	374	136	36.4	1931	do	Milan and Meleney.
General population	20,237	2,305	10.1	1932	do	Meleney et al.
Students	729	38	5.2	1936	Athens, Ga.	Byrd.
Persons on relief	537	33	6.1			
Rural population	322	66	20.5	1936	Georgia	Seckinger.
Students	291	9	3.1	1938	New Orleans, La.	Swartzwelder.
Airline personnel and others	566	42	7.4	1939	Jacksonville, Fla.	Borland.
Accident autopsies	202	13	6.4	1941	New Orleans, La.	Faust.
Students	181	15	8.3	1942	do	Do.
Do	2,393	119	5.0	1942	Berea, Ky.	Headlee and Cable.
Total	31,279	3,729	11.9			
<i>Institutions</i>						
Orphanage	119	66	55.5	1931	New Orleans, La.	Faust.
Mental hospital	70	28	40.0	1941	Milledgeville, Ga.	Reardon.
Do	142	5	3.5	1941	Columbia, S. C.	Young and Ham.
Industrial school	188	8	4.3	1942	Jacksonville, Fla.	Summers.
Newly admitted mental patients.	637	11	1.7	1943	Columbia, S. C.	Burrows.
Mental patients	1,418	116	8.2			
Total	2,574	234	9.1			
Grand total	42,727	4,676	10.9			

whole than in any other section, with the possible exception of the Pacific Coast States.

The number of cases reported in certain southeastern States for various years since 1933 when the occurrence of the disease was first recorded by the Public Health Service is presented in table 5. If these figures could be relied upon at all, they would indicate a gradual reduction of cases in this part of the country. The erratic figures from Mississippi are accounted for by a change in reporting methods in 1947; reports prior to that time were probably inaccurate.

The results of stool surveys for *Entamoeba histolytica* in various population groups in the southeastern States prior to 1945 (table 6), may be compared with the findings of such surveys carried out since 1945 (table 7). Table 8 summarizes the data in tables 6 and 7. The overall incidence of the parasite prior to 1945 was 10.9 percent and that from 1945 to 1954 was 10.5 percent. Thus, insofar as stool examinations are concerned, there is no indication of any marked decline in the incidence of the infection in the population of the south-

eastern States within the past 10 years. These data are certainly not in conformity with the morbidity reports. Several explanations might be offered to account for this discrepancy, but since no factual data are available to support any one of them, they would constitute mere speculations.

### Restudy of Intestinal Parasites

Because of the numerous variables which are recognized as influencing certain comparisons in this presentation, it is of interest to review the data presented by Jones, Smith, and Eyles (18) concerning a restudy of intestinal parasitic infections in a Tennessee community 21 years after a previous survey. Jones was responsible for the technical work in the recent investigation and was also largely responsible for the examinations in the 1930 survey (19). The samplings included many of the same people who were sampled in the former survey. Comparative findings of the principal parasites in the two periods are summarized in table 9. The figures indicate a substantial reduction in

Table 7. Recent surveys for *Entamoeba histolytica* in various population groups in certain southeastern States

Survey group	Number examined	Number positive	Percent positive	Date	Locality	Author
<i>Inpatients and outpatients</i>						
Inpatients and outpatients.....	246	42	17.1	1948	Memphis, Tenn.....	Anderson et al.
Inpatients.....	2,522	321	12.7	1950	Winston-Salem, N. C.....	Maekie et al.
Veterans.....	878	277	31.5			
Outpatients.....	926	54	5.8	1952	Atlanta, Ga.....	Goldman and Johnson.
Veterans.....	400	37	9.3	1954	Chamblee, Ga.....	Brooke et al.
Total.....	4,972	731	14.7			
<i>General Population</i>						
Food handlers.....	58	4	6.9	1948	Chapel Hill, N. C.....	Larsh et al.
Rural population.....	2,657	278	10.5	1953	Fayette County, Tenn.....	Eyles et al.
Do.....	935	100	10.7	1953	Yazoo Delta, Miss.....	Jones et al.
Do.....	322	72	22.4	1954	New Hope, Tenn.....	Do.
Urban population.....	733	26	3.5	1954	Memphis, Tenn.....	Eyles and Jones.
Mental hospital employees.....	191	4	2.1	1954	Milledgeville, Ga.....	Jeffery.
School children.....	1,440	68	4.7	1955	Cumberland County, Tenn.	Young.
Total.....	6,336	552	8.7			
<i>Institution</i>						
Mental hospital.....	1,408	58	4.1	1954	Milledgeville, Ga.....	Jeffery.
Grand total.....	12,716	1,341	10.5			

**Table 8. Summary of surveys for *Entamoeba histolytica* in various population groups in certain southeastern States prior to 1945 and for 1945-54**

Nature of group	Prior to 1945			1945-54		
	Number examined	Number positive	Percent positive	Number examined	Number positive	Percent positive
Inpatients and outpatients-----	8, 874	713	8. 0	4, 972	731	14. 7
General population (nonpatient status)-----	31, 279	3, 729	11. 9	6, 336	552	8. 7
Institutionalized individuals-----	2, 574	234	9. 1	1, 408	58	4. 1
Total-----	42, 727	4, 676	10. 9	12, 716	1, 341	10. 5

parasite incidence over the 21 years. The difference in prevalence appeared to be due primarily to a lower current incidence in the adult population. No special efforts were made during the period represented to reduce the parasite burden of the community, and improvements must be regarded as accruing from economic and general sanitation advances.

### Trichinosis

A number of surveys involving the examination of the diaphragm for *T. spiralis* among persons coming to necropsy in the southeastern States have been conducted by various individuals. The total number of diaphragms examined were 2,233, of which 323, or 14.5 percent, were positive for the parasite (table 10). This incidence figure is only slightly lower than that encountered by Wright, Kerr, and Jacobs (20) in 1943 in the examination of 5,313 diaphragms from 37 States and the District of Columbia, of which 855, or 16.1 percent, were positive.

**Table 9. Results of parasite surveys in a western Tennessee community 1930 and 1951**

Parasite	1930 survey; <sup>1</sup> percent positive of 357 examined	1951 survey; <sup>2</sup> percent positive of 322 examined
<i>Ascaris lumbricoides</i> -----	32. 8	9. 6
<i>Trichuris trichiura</i> -----	10. 6	0. 9
<i>Necator americanus</i> -----	5. 9	1. 9
<i>Entamoeba histolytica</i> -----	38. 1	22. 4

<sup>1</sup> Reference 19.      <sup>2</sup> Reference 18.

The number of reported clinical cases of trichinosis in the region is not impressive, as indicated in table 11, and is certainly not correlated with the infection rate as revealed by the diaphragm surveys. In fact, the southeastern States rank well below many other parts of the United States in the number of reported clinical cases of the disease. This may be due to failure of diagnosis or failure to report some cases but is probably more closely related to food habits and a lower incidence of the parasite in southern swine (21). At any rate, if we are to judge correctly from the available data, trichinosis would not seem to constitute an important health problem in the southeastern States.

### Toxoplasmosis

Toxoplasmosis is still an obscure disease, and little is known concerning its prevalence or mode of transmission. Clinical cases have occurred in the southeastern States, but since the disease is not a notifiable one, there is no record concerning the number of such cases. The only available data which throw light on the occurrence of infection in this part of the country are those derived from the application of the Sabin-Feldman dye test. Feldman (22) tested 270 individuals from New Orleans, La., of whom 84, or 31.1 percent, showed a positive reaction in a titer of 1:16 or greater. Gibson and associates conducted dye tests on 987 individuals from the rural Negro population of Fayette County, Tenn., of whom, he wrote in a personal communication, 27.5 percent were positive. Exclusion of positive serums with titers of 1:4 or

**Table 10. Incidence of *Trichinella spiralis* infections in the population of 10 southeastern States as indicated by findings on diaphragm examinations**

State	Number diaphragms examined	Number positive	Percent positive
Alabama.....	434	148	34.1
Florida.....	15	2	-----
Georgia.....	33	2	-----
Kentucky.....	570	89	15.6
Louisiana.....	600	31	5.2
Mississippi.....	60	4	6.7
North Carolina.....	123	6	4.9
South Carolina.....	15	1	-----
Tennessee.....	250	29	11.6
Virginia.....	133	11	8.3
Total.....	2,233	323	14.5

below reduced the overall incidence by about 8 percent. In a personal communication, Jacobs wrote that he conducted tests on 207 individuals from Norfolk, Va., and found 42 percent positive with a titer of 1:16 or more.

If dye test results are indicative of past or present infection with *Toxoplasma gondii*, and the tests are believed to have considerable validity in this respect, the limited data would indicate that toxoplasmic infection is far from uncommon in the southeast. In addition to congenital toxoplasmosis and acquired post-natal disseminated clinical infections, the role of the organism in the production of chorioretinitis and uveitis (23) indicates that toxoplasmosis may well prove to be a disease of considerable public health importance.

**Table 11. Clinical cases of trichinosis reported from 10 southeastern States in various years**

State	Total cases to Jan. 1, 1949	1949	1950	1951	1952	1953	Total
Alabama <sup>1</sup> .....	2	0	0	0	0	0	2
Florida.....	46	0	0	1	0	0	47
Georgia.....	45	0	0	0	4	0	49
Kentucky.....	10	0	0	0	0	0	10
Louisiana <sup>1</sup> .....	19	0	0	1	2	1	23
Mississippi.....	20	0	0	0	0	0	20
North Carolina.....	4	0	0	0	1	2	7
South Carolina.....	5	0	0	0	0	4	9
Tennessee.....	31	0	1	1	2	2	37
Virginia <sup>1</sup> .....	30	0	0	0	1	0	31
Total.....	212	0	1	3	10	9	235

<sup>1</sup> Not notifiable.

**Table 12. Malaria morbidity reported and cases appraised in the United States, 1948-53**

Year	Reported morbidity <sup>1</sup>		Cases appraised <sup>2</sup>			
	Number cases	Rate per 100,000	Number	Confirmed <sup>3</sup>	Confirmed primary indigenous	Presumptive primary <sup>4</sup> indigenous
1948.....	9,797	6.7	770	242	-----	-----
1949.....	4,231	2.8	514	60	17	46
1950.....	2,227	1.5	713	30	6	39
1951.....	5,600	3.7	<sup>5</sup> 1,874	1,272	14	5
1952.....	7,023	4.5	<sup>5</sup> 3,098	2,707	34	16
1953.....	1,310	0.8	<sup>5</sup> 449	217	30	3
1954.....	<sup>6</sup> 706	-----	124	95	8	1

<sup>1</sup> National Office of Vital Statistics, Public Health Service. <sup>2</sup> Appraised by the Communicable Disease Center, State, or local epidemiologists. Positives all confirmed by blood smear for 1948. <sup>3</sup> Clinically and epidemiologically consistent with malaria, confirmed by positive blood smear. <sup>4</sup> Clinically and epidemiologically consistent with malaria, not confirmed by positive blood smear. <sup>5</sup> Case records on file at the Communicable Disease Center. Many cases of foreign origin investigated by State epidemiologists are not included. <sup>6</sup> Provisional data through Dec. 18, 1954.



## Malaria

The rapid decline and the virtual extinction of malaria in the United States should stand as a fitting monument for all time to those who participated in the campaign, and to all who were engaged in the research and development which contributed to its success.

Great strides were made toward control of the disease during the war years through the Office of Malaria Control in War Areas. - The national malaria eradication program was activated on July 1, 1947 (24) as a cooperative effort on the part of the States and the Public Health Service. As the campaign gained momentum substantial reductions were made in the number of reported cases, a trend which was interrupted only during 1951 and 1952 following the return from Korea of military personnel infected with *Plasmodium vivax* (table 12). When this threat was removed, the number of cases continued to drop, so that by 1954 there were only 8 confirmed primary indigenous cases and 1 presumptive primary indigenous case in the entire country.

The southeastern States, formerly the hotbed of malaria, are now practically free of the disease. Thus there has been conquered, probably for all time, the most serious of the parasitic diseases which have plagued this part of the country since the earliest of colonial days.

## Conclusions

The data presented certainly warrant the general conclusion that remarkable declines have been registered in the incidence and intensity of certain parasitic infections in the southeastern United States. In most areas, intestinal helminths are much less prevalent than they were two decades ago. On the other hand, there appears to have been no marked reduction in the incidence of *Entamoeba histolytica*, although the number of reported cases of amebiasis seems to be on the decline. Trichinosis does not appear to be important in this area. The virtual eradication of malaria has eliminated one of the most serious health problems of the southeast. Zoonotic larval ascariasis and creeping eruption, conditions which are due to larval forms of certain dog and cat parasites, are still prev-

alent in the area; the former will probably be recognized with increasing frequency. Nematode endophthalmitis and toxoplasmosis are known to occur and may also prove to be of increasing importance.

While improvements are obvious, the situation does not warrant complacency. Health is a relative state. A heavy parasite burden is no doubt deleterious, but we cannot be equally certain that a few parasites are entirely innocuous. There are probably many implications of parasitism of which we are not aware. There is increasing evidence, for instance, that certain parasites may be the means of transporting other disease agents. The classic discovery of Shope (25) that the swine lung worms, *Metastrongylus apri* and *Metastrongylus pudendotectus*, carry the virus of swine influenza; the findings of Syverton, McCoy, and Koomen (26) that the larvae of *Trichinella spiralis* are capable of transporting the virus of lymphocytic choriomeningitis; and the recent disclosure by Mochizuki, Tomimura, and Oka (27) that *Toxocara canis* larvae can open the blood-brain barrier and pave the way for the localization of the virus of Japanese B encephalitis should make us hesitate to deprecate too quickly the health hazards of even a modest parasitic invasion of the human body. As Hardy (28) has so aptly stated, "Optimum health, not the mere absence of obvious illness, is the objective of public health and obstacles to the attainment of this goal must be removed. The individual has a right to be free of parasites. . . ."

## REFERENCES

- (1) Stiles, C. W.: Hookworm disease in certain parts of the south: A new plan of attack. South. M. J. 25: 189-192, February 1932.
- (2) Keller, A. E., Leathers, W. S., and Densen, P. M.: The results of recent studies of hookworm in eight southern States. Am. J. Trop. Med. 20: 493-509, July 1940.
- (3) Otto, G. F., and Cort, W. W.: The distribution and epidemiology of human ascariasis in the United States. Am. J. Hyg. 19: 657-712, May 1934.
- (4) Perlingiero, J. G., and György, P.: Chronic eosinophilia: Report of a case with necrosis of the liver, pulmonary infiltrations, anemia and *Ascaris* infestation, Am. J. Dis. Child. 73: 34-43, January 1947.

- (5) Zuelzer, W. W., and Apt. L.: Disseminated visceral lesions associated with extreme eosinophilia. Pathologic and clinical observations on a syndrome of young children. *Am. J. Dis. Child.* 78: 153-181, August 1949.
- (6) Mercer, R. D., Lund, H. Z., Bloomfield, R. A., and Caldwell, F. E.: Larval ascariasis as a cause of chronic eosinophilia with visceral manifestations. *Am. J. Dis. Child.* 80: 46-58, July 1950.
- (7) Behrer, M. R.: Hyper eosinophilia with eosinophilic granuloma of the liver associated with ascaris infestation. *J. Pediat.* 38: 635-639, May 1951.
- (8) Beaver, P. C., Snyder, C. H., Carrera, C. M., Dent, J. H., and Lafferty, J. W.: Chronic eosinophilia due to visceral larva migrans. Report of three cases. *Pediatrics* 9: 7-19, January 1952.
- (9) Wright, W. H.: Observations on the life history of *Toxocara canis* and *Toxascaris leonina*, and the influence of environmental factors on their development. George Washington University Bull. Summaries of doctor's theses, 1934-36, pp. 14-16.
- (10) Mendheim, H., Scheid, G., and Schmidt, J.: Die selteneren Spulwurminfektionen beim Menschen. *Ztschr. f. Tropen-med. u. Parasit.* 3: 368-371, February 1952.
- (11) Wilder, H. C.: Nematode endophthalmitis. *Tr. Am. Acad. Ophthal. & Otolaryng.* pp. 99-109, November-December 1950.
- (12) Nolf, L. O.: Experimental studies on certain factors influencing the development and viability of the ova of the human trichuris as compared with those of ascaris. *Am. J. Hyg.* 16: 288-322, July 1932.
- (13) Keller, A. E., and Leathers, W. S.: The incidence and distribution of *Ascaris lumbricoides*, *Trichuris trichiura*, *Hymenolepis nana*, and *Hymenolepis diminuta* in 36 counties in Kentucky. *Am. J. Hyg.* 23: 216-230, March 1954.
- (14) Hood, M.: The present status of hookworm infection in Florida. *Am. J. Trop. Med.* 27: 505-516, July 1947.
- (15) Hosty, T. W., Wells, D. M., Freear, M. A., and Whitfield, N. K.: Hookworm in Alabama. *J. M. A. Alabama* 23: 179-183, January 1954.
- (16) Donaldson, A. W., Steele, J. H., and Scatterday, J. E.: Creeping eruption in the southeastern United States. *Proceedings Book, Am. Vet. Med. A., 87th Ann. Meeting, 1950*, pp. 83-88.
- (17) Wright, W. H.: The public health status of amebiasis in the United States, as revealed by available statistics. *Am. J. Trop. Med.* 30: 123-133, March 1950.
- (18) Jones, F. E., Smith, C. S., and Eyles, D. E.: Epidemiological study of *Endamoeba histolytica* and other intestinal parasites in the New Hope community of Tennessee. A restudy after 21 years. *Am. J. Trop. Med. & Hyg.* 3: 266-275, March 1954.
- (19) Milam, D. F., and Meleney, H. E.: Investigations of *Endamoeba histolytica* and other intestinal protozoa in Tennessee. II. An epidemiological study of amoebiasis in a rural community. *Am. J. Hyg.* 14: 325-336, September 1931.
- (20) Wright, W. H., Kerr, K. B., and Jacobs, L.: Studies on trichinosis. XV. Summary of the findings of *Trichinella spiralis* in a random sampling and other samplings of the population in the United States. *Pub. Health Rep.* 58: 1293-1313, Aug. 27, 1943.
- (21) Hall, M. C.: Studies on trichinosis. I. The incidence of trichinosis as indicated by post-mortem examinations of 300 diaphragms. *Pub. Health Rep.* 52: 468-490, April 1937.
- (22) Feldman, H. A.: The clinical manifestations and laboratory diagnosis of toxoplasmosis. *Am. J. Trop. Med. & Hyg.* 2: 420-428, May 1952.
- (23) Jacobs, L., Fair, J. R., and Bickerton, J. H.: Adult ocular toxoplasmosis. *Arch. Ophthal.* 52: 68-71, July 1954.
- (24) Andrews, J. M., Grant, J. S., and Fritz, R. F.: Effects of suspended residual spraying and of imported malaria on malaria control in the USA. *Bull. World Health Org.* 11: 839-848 (1954).
- (25) Shope, R. E.: An intermediate host for the swine influenza virus. *Science* 89: 441-442, May 12, 1939.
- (26) Syverton, J. T., McCoy, O. R., and Koomen, J., Jr.: The transmission of the virus of lymphocytic choriomeningitis by *Trichinella spiralis*. *J. Exper. Med.* 85: 759-769, June 1, 1947.
- (27) Mochizuki, H., Tomimura, T., and Oka, T.: Cerebrospinal nematodiasis as a provoking factor in Japanese B encephalitis: An experimental approach. *J. Infect. Dis.* 95: 260-266, November-December 1954.
- (28) Hardy, A. V.: The public health laboratory—Yesterday, today and tomorrow. *Pub. Health Rep.* 68: 968-974, October 1953.



# Veterinary Parasite Problems

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PARASITISM has exerted a tremendous influence on the livestock industry of the southeastern United States. The story of cattle tick fever and its eradication is a familiar one. Other parasitic infections of a less spectacular nature have continued to plague our livestock, usually in the form of inapparent or undiagnosed chronic infections. Such infections tend to attract little attention until an acute clinical outbreak occurs. Certainly parasitism in the domestic animals is not a problem peculiar to the southeastern States, but a number of factors (1) contribute to make many of our problems of greater magnitude than in other areas of the United States.

The very large number of parasites of domestic animals in the southeastern States vary greatly in their distribution, incidence, and pathogenicity. It is difficult to present an accurate, brief account of the veterinary parasite problems. This is particularly true since our knowledge of these parasites is, in many instances, incomplete or entirely lacking. The task is seen to be more difficult when one realizes that the line of demarcation between clinical and subclinical, or latent, parasitism is variable, influenced by a number of factors in the host-parasite relationships. Consequently, many parasites not generally considered to be primarily pathogenic may be of importance in a particular disease of an individual or group of animals.

Specific parasite problems will be discussed by the host relationship. No attempt will be made to rank the infections according to importance or to catalog all of the parasites that may be present as major factors. Rather, a brief summary of internal parasitism in the different animals will be presented, and one or more entities will be discussed in greater detail because of differences in incidence, greater economic importance, or biological interest.

## Cattle

During the past 10 years there has undoubtedly been a greater change in parasitism of cattle in the southeast than in any other host and probably than in any other area. The most striking aspect of this change has been the common occurrence of clinical parasitism in mature animals. The figures below illustrate the marked increase in clinical parasitism in southern Georgia as determined at autopsy by Andrews, Sippel, and Jones at the Tifton, Ga., experiment station (2).

Year	Percent of cattle with clinical parasitism
1945-50	Negligible
1950-51	6
1951-52	11
1952-53	17

From March 21, 1952, to June 2, 1953, 14 animals, aged from 6 months to 10 years, were found to have been suffering from clinical parasitism at autopsy. The animals were from 10 farms on which there was a death loss of 5 percent of 1,900 animals.

Although the criteria are not exactly the

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same, and, no doubt, evaluators differ somewhat, these figures appear to be rather close to those given in the following table taken from the autopsy records of the department of pathology and parasitology, School of Veterinary Medicine, Alabama Polytechnic Institute. The diagnosis for 11.1 percent of 422 cattle autopsied was primary parasitism, and the diagnosis for an additional 5.6 percent of these cattle was secondary parasitism.

The results of Cooperrider's study (3) on the economic losses in cattle due to internal parasitism further emphasize the common occurrence and great importance of clinical parasitism of cattle in this area. We would be amazed if we could but know the magnitude of the loss resulting from combined clinical and subclinical parasitism of cattle in the southeast.

These losses are due primarily to infections with the stomach worms, *Haemonchus*, *Ostertagia*, and *Trichostrongylus*. These natural infections are almost always in the form of a parasitic gastroenteritis, with certain intestinal parasites contributing to the disease. In some instances the intestinal parasites are the primary cause of the syndrome.

There is relatively little information on the number of these parasites required to produce clinical parasitism and death. This is mainly because parasitic infections may be parts of more complex diseases in which malnutrition and concurrent or previous infections with

other pathogens play major roles. Rarely will one find infections with more than 10,000 *Haemonchus*, but as many as 300,000 immature *Haemonchus* have been reported. The presence of 50,000 to 75,000 *Ostertagia* or *Trichostrongylus*, or both, is apparently sufficient to cause severe symptoms and death in some animals. Recent reports include a number of cases with from 200,000 to 500,000 of these worms, and as many as 1,100,000 have been found. In these massive infections a large percentage of the worms often are immature.

All three of the stomach worms are blood-suckers and anemia of variable degree is a characteristic symptom of *Haemonchus* and *Ostertagia* infections. Digestive disturbances, usually in the form of a persistent diarrhea, are almost constantly present. There is a great need for additional information on the host-parasite relationships of these worms, especially with regard to pathogenesis and immunity.

The intestinal helminths contributing most to general parasitic gastroenteritis and which may be primarily responsible for the disease under certain conditions are: *Cooperia* spp.; *Bunostomum phlebotomum*, the cattle hookworm; *Nematodirus* spp.; and *Oesophogostomum radiatum*, the nodular worm.

There are a number of other helminths in the intestines of cattle, but they generally are of little pathogenic importance in the southeast. One or two of these should be mentioned, however. *Neoscaris*, the cattle ascarid, may be a problem in individual herds. It apparently is found more in scattered herds in Louisiana and Florida than in any other of the southeastern States. The anoplocephaline tapeworms, *Moniezia* spp., are quite common but appear to be relatively nonpathogenic. There is, however, the tendency to attribute damage produced by the minute parasites to these large ones.

Coccidiosis continues to be an important problem in many herds. Of the 10 species occurring in cattle in this area, *Eimeria zurnii* and *Eimeria bovis* are the most pathogenic, but some of the others may contribute to, or be primarily responsible for, the infection. As is true with the worm infections, older animals may also have clinical coccidiosis.

*Fasciola hepatica* infections have been diagnosed in a number of the southeastern States.

Primary and secondary parasitism as found at autopsy at the Alabama Polytechnic Institute, May 1, 1953, to Mar. 18, 1955.

Host	Number animals autopsied (all ages)	Primary parasitism <sup>1</sup>		Secondary parasitism <sup>2</sup>	
		Number	Per cent	Number	Per cent
Dog.....	532	38	7.2	23	4.3
Cat.....	51	3	6.8	2	3.9
Sheep and goat.....	52	8	15.3	1	1.9
Cattle.....	422	47	11.1	24	5.6
Equine.....	46	3	6.5	2	4.3
Hog.....	186	5	2.6	7	3.7

<sup>1</sup> Considered the primary cause of death. <sup>2</sup> Considered to be a contributing factor to the illness and death of the animal.

At the present time the only State east of the Mississippi River in which *Fasciola* infection is considered to be of any appreciable importance is Florida. *Fascioloides* infection is probably much more widespread than reports indicate. Although many deer in certain areas of Alabama are infected, the first bovine case came to our attention last year. It is not known if the case was an autochthonous infection.

Lungworm infection is quite widespread in the southeast, and is especially important in the low, wet areas which provide an ideal environment for the larvae. Heavy infections often result in severe bronchitis and death. We do not appear to have in the area the "atypical" lungworm infection of mature cattle described recently by the English workers (4), but the possibility of this should not be overlooked, especially in the wet areas.

Bovine genital trichomoniasis, caused by *Trichomonas foetus*, has been diagnosed in practically all the States. This disease does not appear to have caused as much trouble in most southeastern States as it has in the more heavily concentrated dairy areas of the midwest. In individual herds in any of the States, however, it may be of great economic importance. Until 1954 we knew of no definite diagnosis of this infection in Alabama. Our first diagnosis was made in a herd into which bred heifers were brought from a midwestern State. Since that time the infection has been diagnosed in three additional herds and probably exists in a number of others.

Although the exact classification of the etiologic agent of anaplasmosis is unsettled, it is included with the parasitic diseases in this discussion. In some of the southeastern States anaplasmosis is currently of only spotty distribution and little importance. However, South Carolina, Florida, Mississippi, and Louisiana may truly be referred to as enzootic areas. The incidence and distribution of this disease is intimately related to, but not limited by, the density of the several arthropod vectors which may transmit it.

### Sheep and Goats

The prevalence of internal parasites was a major factor in the decline of the sheep in-

dustry in a number of southeastern States in years past, and the promise of better control measures has contributed to an increase in the sheep population in recent years. Since many of the problems are much the same as for cattle and are produced by the same or closely related species of parasites, no separate discussion for these hosts will be given in this general and brief review.

### Swine

A number of the gastrointestinal parasites of hogs are not appreciably different in the southeastern States from most of the rest of the country, although the intensity of infection may be somewhat heavier. The stomach worms are widely distributed, but are not often primarily responsible for trouble. The hog ascarid is also widely distributed and of major importance. Undoubtedly many of the factors relating to the distribution and epidemiology of the human ascarid are also operative in this infection.

The thorny head worm of hogs is not as widely distributed as the ascarid but may be an important problem in given herds, in which control is difficult. Occasionally, death occurs from light infections due to peritonitis resulting from perforation of the intestinal wall by the proboscis. Of the several species of nodular worms infecting the hog, only one, *Oesophagostomum dentatum*, appears to be widely distributed in this country. The others are somewhat restricted to the southeastern States. Lungworm infection is quite common and is often the cause of respiratory symptoms and even death.

The kidney worm of hogs, *Stephanurus dentatus*, is of little importance outside the southeast. In fact it is only in the lower tier of States and up the Atlantic seaboard to Virginia that the infection is of any great significance. In these areas, however, it is still a major problem, and losses occur in a number of ways. The loss most easily determined is that due to condemnation or trimming of parts of carcasses at the killing abattoir.

According to a personal communication from J. A. Langford a heavy infection with the larval stage of *Diphyllbothrium* (*Spirometra*)

*mansonoides* was diagnosed in a range hog in Florida recently.

## Poultry

Little will be said about poultry parasites. The common gastrointestinal helminths and protozoa are widely distributed and of variable importance throughout the southeast.

*Leucocytozoon smithi* infection of turkeys appears to be quite common in many parts of the southeast, as evidenced by the observations of a number of workers (5-8). Bierer (8) indicates that this is primarily a disease of the tide-water area along the eastern seaboard. Recent outbreaks in South Carolina have been particularly striking. Wild turkeys apparently served as a reservoir of infection. The disease may be very acute and highly fatal as described by Stoddard and associates (7), who reported 75 percent mortality of 1,600 birds in 7 days, or it may be more insidious and with low mortality. The latter outbreaks may be associated with the breeding season in which case there seems to be a greater mortality in toms than in hens.

## Equines

With the decrease in the horse and mule population, a number of the parasite problems in these animals have become less marked but have by no means disappeared. Bot infections are still very common, and marked gastritis due to infections with *Trichostrongylus axei* is quite common. The latter is not surprising in view of the increasing importance of this parasite in ruminants, inasmuch as there is good evidence that cross transmission occurs. Cutaneous habronemiasis is seen much less than in earlier years. However, this disease may constitute a problem on even the best of farms if the animals are infected with the adult worms and there is a high transmission potential because of an abundant fly population.

The most important intestinal parasites are the ascarid, *Parascaris equorum*, and the strongyles, particularly the large strongyles, *Strongylus vulgaris*, *Strongylus edentatus*, and *Strongylus equinus*. Ascarid infections are usually of clinical significance only in young

animals. In addition to the bloodsucking activity of the large strongyles, the parasitic aneurysm produced by *S. vulgaris* is of great importance. This aneurysm, with the resulting thrombus formation, of the anterior mesenteric artery may cause a variety of intestinal disturbances, and frequently results in death. Pinworm infection may constitute a problem in individual or groups of animals, but it generally is of little pathogenic importance.

## Dogs and Cats

*Spirocerca lupi*, the dog esophageal worm, appears to be very rare in this country except in the south. Over a period of approximately 4 years we have found slightly over 4 percent of 943 dogs of all ages infected (9). Since this includes a large number of puppies, the incidence in dogs old enough for the life cycle to have been completed would be appreciably higher. Only a small percentage of the dogs infected with *Spirocerca* show clinical symptoms. However, this infection takes on added interest and importance in view of the recent report by Seibold and associates (10) that it may be an inciting cause of the development of malignant esophageal tumors of the dog.

A number of intestinal helminths are very widely distributed, not only in the southeast but in much of the Nation, and some are highly pathogenic. We have no comprehensive figures on the incidence of *Strongyloides* in the dog in the southeast, but it is certainly more common than the reports indicate. It is often the cause of respiratory symptoms and intestinal disturbance, and the mortality rate in heavily infected puppies is quite high. Although the worm is apparently indistinguishable from *Strongyloides* of man, it is likely that man does not easily become infected with the dog form.

The hookworms, *Ancylostoma caninum* and *Ancylostoma braziliense*, continue to take a heavy toll of our young dogs. Prenatal infections are very common and highly pathogenic. Some of the heaviest infections have been in mature dogs concurrently suffering with some other disease.

Roundworm infections are very common, especially in young dogs, with prenatal infection

again being of great importance. *Toxocara canis* is the one most often encountered.

Light tapeworm infections are found in a high percentage of dogs, and heavy infections are common. *Dipylidium caninum* is the one found most often in this area, but *Taenia taeniaformis* and *Taenia pisiformis* are not uncommon and seem to occur most often in the cat. There is a recent report of natural infection of dogs with *Echinococcus granulosus* in Mississippi (11). The public health importance of this needs no elaboration.

Pseudophyllidean tapeworms appear to be rare in dogs in this area. *Diphylllobothrium latum* has been reported from Florida. *D. (Spirometra) mansonioides* has been reported from Louisiana and, during the past year, from the Alabama-Georgia area (12). Langford, who recently sent us the larvae of this parasite from a hog, in his letter reported finding a number of cases of *Diphylllobothrium* infection in dogs and cats.

Light to moderate infections with the whipworm, *Trichuris vulpis*, are common in the dog, and occasionally very heavy infections are encountered in which the parasite is apparently the cause of death. In such cases, not only is the cecum filled with worms, but the entire surface of the colon is covered.

A number of intestinal protozoa are commonly found in the dog. Eyles and associates (13) have recently reported finding 8.4 percent of 143 dogs in Memphis, Tenn., infected with *Entamoeba histolytica*, using cultural methods. We certainly agree with their observation that cysts of *E. histolytica* are almost never passed and that the trophozoites are passed in small numbers in the feces of dogs.

Shown below are the protozoan infections found by direct smear examinations at the small animal clinic, Alabama Polytechnic Institute, from September 1953 to May 1954. Of 871 dogs examined, 193, or 22 percent, were found to have protozoan infections, although there may have been more than one infection per dog.

	Number	Percent
<i>Giardia</i> .....	75	8.6
<i>Trichomonas</i> .....	57	6.5
<i>Isospora</i> .....	44	5.0
<i>Entamoeba histolytica</i> .....	7	.8
<i>Entamoeba coli</i> .....	1	.1
<i>Balantidium</i> .....	9	1.0

Each of the seven dogs infected with *E. histolytica* showed a characteristic profuse diarrhea, continuous or intermittent and often of long duration. In the *E. coli* infection, cysts were being passed, and this dog was concurrently infected with *E. histolytica*. Only a small percentage of the dogs infected with *Giardia* showed symptoms attributable to the organism. It is possible even in these cases that the symptoms are not due solely to the protozoan. There is evidence (14) suggesting that a combined *Giardia* (protozoa) and *Pseudomonas* (bacteria) infection may be quite pathogenic in the chinchilla. The intestinal trichomonads are common in the dog, and the incidence figure rises rather markedly when cultural methods are used in diagnosis. Here again the organism appears to be associated occasionally, apparently in some causal relationship, with a severe diarrhea, which may also be of long duration.

Even though occurring in a low percentage of dogs, *Balantidium* infection is much more common than we had earlier suspected. It appears to be pathogenic in the dog in practically every infection. Light infections with the dog coccidia are common, and when animals, especially puppies, acquire heavy infections, marked symptoms and death may result. In Georgia, 2 of 3 recently reported cases of human infection with *Isospora* appeared to be related to an infection in the family dog (15).

Although we probably have more information on the distribution of *Dirofilaria immitis*, the dog heartworm, than on almost any other of the parasites of veterinary importance in the southeast, its distribution still has not been well defined. The infection is obviously quite common in many areas where it is not present at disease-producing levels. The presence of adult worms in sufficient numbers to result in clinical infection is evidence of a high transmission potential. On the basis of current information this appears to be common in the southeast only along the seacoast. There are inland areas where the transmission potential is sufficiently high to result in the presence of moderate numbers of adults and even in some instances in clinical infection, as emphasized by Eyles and associates (16) in their recent study in the area of Memphis, Tenn. Auburn, Ala., is a good



example of an area with low transmission potential. In a recent limited survey it was found that microfilariae could be demonstrated, using concentration procedures, in approximately 37 percent of the dogs. Our autopsy records of the past 5 years have not been summarized to give the incidence of adult worms, but it certainly is appreciably lower than the 4 percent found in Memphis. The only clinical cases which have come to autopsy in recent years were sent to us from coastal areas where the infection is certainly a major problem.

There are a few reported cases of the giant kidney worm, *Dioctophyma renale*, in the southeastern States (17). There appears to be a small enzootic area in southeast Georgia.

We do not know how common canine toxoplasmosis is in the southeast. Serologic tests made elsewhere indicate that inapparent or otherwise undiagnosed cases are quite common, as in other animals. From July 1954 through March 1955 we autopsied 148 dogs, of which 6, 4 percent, were diagnosed as toxoplasmosis, or toxoplasmosis together with distemper. In addition to these cases from autopsy, all of which were from Alabama, we have made a diagnosis during this period of toxoplasmosis from at least one place in Florida, Georgia, South Carolina, Virginia, and Tennessee by the histological examination of tissues sent to us by practicing veterinarians.

The cat lungworm *Acleurostrongylus abstrusus*, has been reported from Maryland, Virginia, North and South Carolina, Georgia, Tennessee, and Alabama (18). In these States although there are few reports of the infection, mostly only 1 or 2, many of these are fatal infections. Probably the infection is much more common than published reports indicate, as suggested by the recent finding of the infection in 6 of 50 cats in a Virginia county.

#### Information Needed

There are many different aspects of these and other infections that could profitably be discussed. This very incomplete account will be closed by pointing out the general needs with regard to veterinary parasitology in the southeast.

1. More information on the distribution and

incidence of parasitic infections to determine more clearly the true nature and extent of the problem.

2. Better use of the information currently available in the control of these parasites.

3. More information on the biology and host-parasite relationships of the many parasites common in the southeast, for only on this foundation can we build truly effective control programs.

#### REFERENCES

- (1) Schwartz, B.: Parasitism in relation to the livestock industry of the south. *Scient. Monthly*, 54: 448-454, May 1942.
- (2) Andrews, J. S., Sippel, W. L., and Jones, D. G.: Clinical parasitism of cattle in the southeast. *Proc. U. S. Livestock Sanit. A.*: 228-238 (1954).
- (3) Cooperrider, D. E.: Losses in cattle due to internal parasitism. *North Am. Vet.* 35: 350-353, May 1954.
- (4) Taylor, E. L.: Parasitic bronchitis in cattle. *Vet. Rec.* 63: 859-867, Dec. 22, 1951.
- (5) Travis, B. V., Goodwin, M. H., Jr., and Gambrell, E.: Preliminary note on the occurrence of *Leucocytozoon smithi* Laveran and Lucet (1905) in turkeys in the southeastern United States. *J. Parasitol.* 25: 278, June 1939.
- (6) West, J. L., and Starr, L. E.: Further observations on a blood protozoan infection in turkeys. *Vet. Med.* 35: 649-653, November 1940.
- (7) Stoddard, E. D., Tumlin, J. T., and Cooperrider, D. E.: Recent outbreaks of *Leucocytozoon* infection in adult turkeys in Georgia. *J. Am. Vet. M. A.* 121: 190-191, September 1952.
- (8) Bierer, B. W.: Buffalo gnats and *Leucocytozoon* infection of poultry. *Vet. Med.* 49: 107-110, March 1954.
- (9) Folse, D. S., and Newberne, J. W.: *Spirocerca lupi* infection in dogs. A four year survey. *North Am. Vet.* 35: 519-522, July 1954.
- (10) Seibold, H. R., Bailey, W. S., Hoerlein, B. F., Jordan, E. M., and Schwabe, C. W.: Observations on the possible relation of malignant esophageal tumors and *Spirocerca lupi* lesions in the dog. *Am. J. Vet. Res.* 16: 5-14, January 1955.
- (11) Franklin, M. A., and Ward, J. W.: *Echinococcus* infections in Mississippi. A new record of a natural infection in dogs. *J. Parasitol.* 39: 574, October 1953.
- (12) Thorson, R. E., and Jordan, E. M.: A pseudophyllidean tapeworm from a dog in the southeastern United States. *Proc. Helminthol. Soc. Washington* 21: 123-124, July 1954.



- (13) Eyles, D. E., Jones, F. E., Jumper, J. R., and Drinnon, V. P.: Amebic infections in dogs. *J. Parasitol.* 40: 163-166, April 1954.
- (14) Shelton, G. W.: Giardiasis in the chinchilla. II. Incidence of the disease and results of experimental infections. *Am. J. Vet. Res.* 15: 75-78, January 1954.
- (15) Routh, C. F., McCroan, J. E., and Hamer, C. G.: Three cases of human infection with *Isospora* in Georgia. *Am. J. Trop. Med. & Hyg.* 4: 1-8, January 1955.

- (16) Eyles, D. E., Gibson, C. L., Jones, F. E., and Cunningham, M. E. G.: Prevalence of *Dirofilaria immitis* in Memphis, Tennessee. *J. Parasitol.* 40: 216-221, April 1954.
- (17) Ehrenford, F. A., and Snodgrass, T. B.: Incidence of canine dictyophymiasis (giant kidney worm infection) with a summary of cases in North America. *J. Am. Vet. M. A.* 126: 415-417, May 1955.
- (18) Bailey, W. S., and Lowman, C. B.: Verminous pneumonia. *Auburn Vet.* 9: 36-38, Fall 1952.

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# Silicosis and Dust Control

—Vermont's Granite Industry—

By HARRY B. ASHE, B.S.

VERMONT granite is a heterogeneous mixture of approximately 60 percent feldspar, 30 percent quartz, 15 percent mica, and 5 percent miscellaneous silicates. Quartz is, of course, the black sheep of the group of minerals which comprise this monumental stone.

Pneumatic tools came into general use between 1895 and 1900, accompanied by a tremendous increase in dust production over that produced by hand tools. Industrywide dust control for all dust-producing operations had its beginning in 1937. Hence, the period of greatest dust exposure in the Vermont granite manufacturing industry is about 40 years.

## A Bench Mark

The year 1937 is a bench mark in the Vermont granite manufacturing industry. A program of dust control for all dust-producing operations was put into effect by the industry. A division of industrial hygiene was created in the Vermont Department of Health, and for

many years it concentrated most of its efforts in improving working conditions in the industry. The division purchased a portable X-ray machine and began a yearly X-ray program, which is still in effect.

During the period 1924-26, dust exposures in this industry were reported by the Public Health Service to be about 1 to 200 million particles per cubic foot of air. Granite cutters who suffered the most severe exposure averaged an exposure of about 60 million particles per cubic foot of air (1). Since the beginning of plant-wide dust control in 1937, the dust exposure has been gradually reduced.

Recent dust counts in the industry indicate a general air dustiness of 1 to 2 million particles per cubic foot of air, with few individual operators exposed to greater than 5 million particles per cubic foot of air. Recirculation of dust collectors has been completely discontinued, and dry dust-producing operations in the industry are provided with an approved type dust collector. Every exhaust unit in the industry is inspected by the division of industrial hygiene at least twice a year, and detailed reports are sent to the individual manufacturer with a mandatory compliance order wherever corrections or improvements are necessary.

During 1937 and 1938 there was a very definite effort to encourage men to visit the division office for an X-ray at any time during their free hours. During that period, the division X-rayed 805 granite workers for the first time.

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*Mr. Ashe, director of the division of industrial hygiene, Vermont Department of Health, since 1946, served as program chairman of the American Conference of Governmental Industrial Hygienists, 1953-54, and as chairman, 1954-55. This paper was presented at the 17th annual meeting of the conference in Buffalo, 1955.*

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**Table 1. Number of granite workers X-rayed, Vermont Department of Health, 1937-54**

Year	Number X-rayed		
	First time	Re-checks	Total
1937	645	0	645
1938	160	211	371
1939	89	169	258
1940	90	155	245
1941	137	308	445
1942	83	251	334
1943	86	212	298
1944	38	183	221
1945	37	248	285
1946	109	235	344
1947	62	325	387
1948	203	452	655
1949	36	320	356
1950	239	698	937
1951	475	519	994
1952	209	1, 178	1, 387
1953	191	1, 262	1, 453
1954	131	1, 306	1, 437
Total	3, 020	8, 032	11, 052

From 1938 to 1950, evening clinics were held for granite workers in the division office. Results are shown in table 1. However, many men were not availing themselves of this service provided by the State of Vermont, and in 1950 arrangements were made with the various manufacturers to set up our portable X-ray machine in their establishments so that men could be X-rayed on company time. By this change of procedure, 937 and 994 men were X-rayed in 1950 and 1951, respectively.

### Mobile X-ray Unit

During the summer of 1951 we conceived the idea of constructing a mobile X-ray unit whereby our X-ray machine could be transported to every shed in the area and our service offered to the men at a distinct saving to the manufacturer. This unit was put into service in the fall of 1951 with an increase in participation of about 400 men a year.

The 26-foot trailer consists of a small room in the rear for occupational histories, a dark-room for changing films, an X-ray compartment in the middle, and a dressing room in the front. A 3,000-watt, 220, 110-volt generator supplies the power, and a State-owned auto-

mobile provides the transportation. Lead-lined plywood is used in the interior construction to protect operating personnel from stray radiation.

This mobile X-ray unit, designed to X-ray men in dusty trades at their place of employment, was put into operation in September 1951. It has traveled 8,000 miles and taken 13,776 X-rays. The industries covered are granite, marble, slate (quarrying and finishing); asbestos (quarrying and milling); talc (mining and milling); copper (mining and processing); foundries (gray iron). The cost of the unit follows:

26-ft. Travelo trailer, custom built, with furnishings	\$3, 072
Pickup portable X-ray machine, 15 ma., 8-step voltage control. 14" by 17" plates	1, 350
Pass box, cassette holder, cassettes, and other accessories	805
3,000-watt Onan electric plant, installed	910
State-owned automobile, overload springs, trailer hitch, accessories	2, 727
Total cost	\$8, 864

### 1937-1938

Approximately 2,400 men were employed in the Vermont Barre Belt granite manufacturing district in each of the years 1937 and 1938. Of the 805 men X-rayed, 365 had silicosis (45.3 percent); and 143 had silicosis with possible infection (17.9 percent).

All cases with definite X-ray evidence of nodular silicosis, whether it be early, moderately advanced, far advanced, or complicated with infection, are grouped together. In the category "silicosis plus possible infection," the infection is presumed to be tuberculosis. However, in these data (table 2) there has been no attempt to prove the existence of infection. It is very probable that a number of the men listed in this category have nothing more than a conglomerate silicosis. Some of them may have cavitation and positive sputa. For the purpose of this paper they are likewise grouped together.

### 1952-1954

The 3 years from 1952-54 have been taken for comparison with 1937-38 inasmuch as the

**Table 2. Number of granite workers X-rayed and found to have silicosis, Vermont Department of Health, 1952-54**

Number of men	1952		1953		1954	
	Number	Percent	Number	Percent	Number	Percent
On payroll	1,736		1,810		1,809	
Working, day of X-ray	1,616		1,786		1,691	
X-rayed	1,387	85.8	1,453	81.4	1,437	84.9
On payroll, previously X-rayed but not in indicated year	185		232		261	
On payroll, X-rayed at least once	1,572	90.6	1,685	93.2	1,698	93.9
Found with silicosis	274		253		219	
On payroll, diagnosis silicosis, X-rayed at least once, but not in indicated year	45		69		75	
On payroll, diagnosis silicosis	319	18.4	322	17.9	294	16.2
Found with silicosis plus possible infection	54		44		28	
On payroll, diagnosis silicosis plus possible infection, X-rayed at least once, but not in indicated year	4		18		14	
On payroll, diagnosis silicosis plus possible infection	58	3.3	62	3.4	42	2.3

mobile X-ray unit was in operation during these years, and the greatest cooperation was received from both employer and employee. The data in table 2 indicate the proportion of persons in the Vermont granite manufacturing industry who were X-rayed during these years and found to have silicosis.

The gradual decrease in the incidence of silicosis from a high of 45.3 percent in 1937 and 1938 to a low of 16.2 percent in 1954 may be attributed to two causes: dust control and silicotics leaving the industry for one reason or another. The incidence of silicosis with possible infection has been reduced from 17.9 percent to 2.3 percent over the same period.

The X-ray program began in 1937. Consequently, there could be no backlog of X-ray data then. Hence, the data for the years 1937 and 1938 cannot be compared on the same basis with data for the years 1952-54. However, we believe, the data presented here demonstrate an apparent striking decrease in the incidence of this occupational disease in a very hazardous industry. The majority of the 2,400 men employed in the industry in 1937 probably had more than 10 years experience; only 34 percent of these were X-rayed, and 45 percent of those X-rayed were found to have silicosis. It is gen-

erally believed that if it had been possible to examine the chest X-rays of every man employed in the industry at that time the incidence of silicosis might even have been higher. In 1954, for contrast, of all the men on the payroll, 18.4 percent were found to have silicosis (or 19.8 percent of those who had X-rays). Participating in the program, however, were 90.6 percent of the employees.

### Summary

Our X-ray program started in 1937. Dust control started the same year and has gradually improved ever since. The State health department has not to this day discovered a case of silicosis in any man who has worked only in the Vermont granite manufacturing industry since 1937. It is our contention that this remarkable record is mainly due to effective dust control within the industry.

### REFERENCE

- (1) Russell, A. E., Britten, R. H., Thompson, L. R., and Bloomfield, J. J.: The health of workers in dusty trades. II. Exposure to siliceous dust (granite industry). Public Health Bulletin No. 187. Washington, D. C., U. S. Government Printing Office, 1929.

# Venereal Disease in Migrant Workers New Jersey, 1954

By ADELE C. SHEPARD, M.D., M.P.H., and WILLIAM J. PAGE, Jr., B.A.

ABOUT 18,000 migrant workers are required each year to supplement local labor in agriculture and in the food processing industries (1), the New Jersey Department of Labor and Industry estimates. This does not include the seasonal labor force necessary to meet the needs of resort areas, race tracks, and other industries which utilize migrant labor. In 1954, approximately 9,000 persons from Puerto Rico, 6,000 southern Negroes, and 3,000 workers of various types from neighboring cities came into New Jersey as migrant workers.

Examination of 3,401 migrant agricultural workers in New Jersey in 1953 showed a very high incidence and prevalence of venereal disease (2). The serologic survey of this group was continued in 1954 and, in addition, a survey was made of migrant race track workers and itinerant workers in the seafood industries. This report presents the results of the latter survey.

Generally speaking, migrant workers do not receive regular medical services (3). At best, the rural areas where they find employment usually have inadequate public health facilities

so that the extension of existing services to include migrant workers is minimal. Furthermore, the training of migrants is such that they often do not take advantage of even such assistance as is made available to them. The special migrant health program provided in New Jersey, therefore, is a product of necessity (4). The program is largely one of venereal disease control, although some attention is given to other health problems.

The first large groups of agricultural workers begin to arrive in New Jersey in May, although the majority do not appear until July. Permanent clinics have been established in three areas of heavy concentration of migrants, and a mobile unit operated for about 6 weeks during the peak season reaches more than half the persons tested each year. The remaining workers are tested at the permanent clinics. The staff of each clinic consists of professional, technical, and clerical personnel. During the period July 15–September 15, two additional persons are usually employed to contact farmers, contractors, and workers in order to promote clinic attendance. Although there is a legal requirement that workers obtain physical examinations, few of them actually apply for medical service until they are motivated by a personal visit from a member of a clinic staff.

In 1954, a total of 3,288 farm migrants were examined for venereal disease during clinic sessions. All persons over 12 years of age were tested serologically for syphilis and an inspection of mouth and genitalia was ordered on all

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males. All females with positive serologic tests for syphilis (STS), all contacts of both sexes to cases of venereal disease, and all individuals complaining of or manifesting obvious signs or symptoms of disease had a more complete examination. A presumptive diagnosis of venereal disease was permitted on the basis of objective clinical findings or one positive or doubtful result of the STS. No spinal fluid examinations were done. Routine treatment for syphilis was 4,800,000 units of procaine penicillin in oil with 2 percent aluminum monostearate (PAM) given in four sites in the buttocks during a single clinic visit; for gonorrhea, the treatment was 600,000 units of PAM.

### Discovery Rate Decreasing

When summary data for 1954 are compared with summary data for 1953, there appears to be a decreasing discovery rate of venereal disease among agricultural migrants. Of the 3,288 farm migrants examined in 1954, 22.8 percent were reactive for syphilis (table 1). The proportion was 25.2 in 1953.

The number of diagnoses of infectious venereal disease also showed a decrease last year over the year before. A total of 198 patients with clinical gonorrhea was treated in 1953 and only 118 in 1954 (table 2). Similarly, 19 cases of primary and secondary syphilis were found during 1953, whereas only 9 such cases were seen last year.

The number of persons brought or returned to treatment for syphilis dropped from 406 in

1953 to 232 in 1954. Several factors might account for this decrease. Although in 1954, followup of persons with positive and doubtful blood tests was better than average for survey work—85.1 percent of the 758 suspects were brought to examination—the proportion was less than the 95.6 percent brought to examination in 1953 (table 3). In addition, many individuals were not treated because they were judged either to have had adequate treatment previously or not to be infected with syphilis. Records of previous blood tests and previous therapy for many individuals who return to New Jersey year after year are now accumulating to assist physicians in ruling out the need for treatment. Also, when patients with positive STS results give a fairly reliable history of previous treatment elsewhere, they are not required to return for re-treatment.

### Epidemiological Study

With existing facilities, there is apparently no easy solution to the problem of thorough contact interviewing and investigation in the migrant labor group. In the migrant health clinics, thorough epidemiological study was very difficult for several reasons:

1. Space was inadequate for proper contact interviewing.
2. Lack of privacy reduced the effectiveness of interviewing.
3. In crowded clinic situations, physicians often failed to refer patients for interview.
4. Interviewers were often pressed into serv-

**Table 1. Results of serologic tests for syphilis in migrant agricultural workers, by age group and sex, New Jersey, 1954**

Age group	Total tests			Number positive			Number doubtful			Percent positive and doubtful		
	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female
All ages.....	3, 288	2, 220	1, 068	397	236	161	352	232	120	22. 8	21. 1	26. 3
Under 15.....	210	119	91	8	3	5	8	5	3	7. 6	6. 7	8. 8
15-24.....	1, 091	736	355	66	43	23	37	23	14	9. 4	9. 0	10. 4
25-34.....	878	613	265	103	51	52	109	66	43	24. 1	19. 1	35. 8
35-44.....	654	452	202	118	62	56	120	83	37	36. 4	32. 1	46. 0
45-54.....	313	203	110	63	46	17	55	40	15	37. 7	42. 4	29. 1
55-64.....	102	71	31	27	21	6	19	12	7	45. 1	46. 5	41. 9
65 and over.....	12	10	2	7	6	1	2	1	1	75. 0	70. 0	100. 0
Not stated.....	28	16	12	5	4	1	2	2	0	25. 0	37. 5	8. 3

ice as clerks or technicians in order to process large numbers of patients during short clinic sessions.

To the extent permitted within these limitations, patients with infectious venereal disease were interviewed and their contacts were investigated (table 4). In the interview, particular emphasis was placed on eliciting the names of those contacts who were known to be in the migrant labor force in New Jersey.

### Race Track Workers

In addition to those employed in agriculture, there is another group of migrants, the race

track workers, in which the State department of health has been interested for many years. The three large tracks devoted to horse racing operate for several weeks each year in an intermittent season running from May to October. Grooms, stable boys, exercise boys, jockeys, and concession employees follow the racing business in much the same manner as the migrant farm workers follow the harvest seasons. The Migrant Labor Law (4) makes it mandatory that these migrants be examined for venereal disease just as it requires that agricultural migrants be examined.

A total of 1,172 race track workers had sero-

**Table 2. Cases of venereal disease among migrant agricultural workers diagnosed through serologic tests and physical examination by migrant health clinics, New Jersey, 1953 and 1954**

Disposition of case	1953	1954				
	All clinics	All clinics	Orchard Center, Gelston Village	Freehold	Prospect Plains	Mobile unit
Total cases diagnosed.....	967	631	74	65	103	389
Brought to treatment.....	542	290	55	20	47	168
Syphilis.....	340	171	41	18	26	86
Primary and secondary.....	19	9	0	0	0	9
Early latent.....	135	90	29	6	5	50
Other.....	186	72	12	12	21	27
Gonorrhea.....	198	118	14	2	21	81
Other venereal disease.....	4	1	0	0	0	1
Returned to treatment for syphilis.....	66	61	9	6	15	31
Previously adequately treated for syphilis.....	359	280	10	39	41	190

**Table 3. Results of investigation of migrant agricultural workers with positive or doubtful results of serologic tests for syphilis, New Jersey, 1953 and 1954**

Disposition of case	1953	1954				
	All clinics	All clinics	Orchard Center, Gelston Village	Freehold	Prospect Plains	Mobile unit
Total investigated.....	799	1 758	95	75	132	456
Examined:						
Number.....	764	645	60	74	92	419
Percent.....	95. 6	85. 1	63. 2	98. 7	69. 7	91. 9
Not examined.....	35	113	35	1	40	37
Uncooperative.....	0	14	14	0	0	0
Moved out of jurisdiction.....	10	34	6	0	8	20
Cannot locate.....	20	58	12	1	30	15
No disposition after 30 days.....	5	7	3	0	2	2

<sup>1</sup> Includes 9 suspects (positive STS) referred to New Jersey by other States.

**Table 4. Results of venereal disease contact interviewing and investigation of migrant agricultural workers, New Jersey, 1953 and 1954**

Disposition of cases	Syphilis						Gonorrhea	
	Primary and secondary		Early latent		Other			
	1953	1954	1953	1954	1953	1954	1953	1954
Number patients interviewed .....	15	6	29	22	1	1	121	48
Number contacts obtained .....	48	12	99	36	1	3	153	62
Contact index .....	3 20	2 00	3. 41	1. 64	1. 00	3. 00	1 26	1. 29
Number investigations assigned .....	7	4	6	2	1	1	128	27
Results of investigation:								
Number contacts examined .....	6	4	6	2	1	1	99	27
Number infected with disease of patient ..	2	3	3	2	1	1	43	17
Number treated <sup>1</sup> .....	2	1	0	0	0	0	49	10

<sup>1</sup> Prophylactic or epidemiological treatment.

**Table 5. Venereal disease diagnosed through serologic tests and physical examination of 1,172 race track workers, New Jersey, 1954**

Disposition of cases	Track			
	All tracks	Atlantic City	Garden State	Monmouth Park
Total reactive.....	180	76	70	34
Number diagnosed.....	130	73	33	24
Brought to treatment.....	53	39	6	8
Syphilis.....	37	24	5	8
Primary and secondary.....	2	0	2	0
Early latent.....	12	9	-----	3
Other.....	23	15	3	5
Gonorrhea.....	16	15	1	0
Returned to treatment with syphilis.....	22	15	0	7
Previous treatment adequate.....	53	17	27	9
Infected, not treated.....	2	2	0	-----
Not infected.....	19	8	8	3

logic tests for syphilis during 1954. Since many of the same workers were employed at each of the three race tracks during the course of the racing season, cards indicating that blood tests had been taken were given to them so that not more than one blood test would be required of each individual. Of the 1,172 workers tested, 180, or 15.4 percent, were reactive for syphilis (table 5). Of the reactors, 59, or 32.8 percent, were brought or returned to treatment. As in the agricultural migrant group, more than half of the suspects diagnosed as infected with venereal disease were declared previously adequately treated or as not infected with syphilis.

Sixteen cases of gonorrhea were found and treated.

#### Itinerant Seafood Industry Workers

Besides agricultural and race track migrants, approximately 1,000 seasonal employees of seafood industries were tested during recent months. A group of plants in South Jersey employ a physician to examine and treat their employees for venereal disease. Complete data are not available at this time concerning the outcome on approximately 750 persons thus examined.



However, the State department of health arranged for the testing of 243 individuals who were directly or indirectly associated with the seafood industry; 77 reactors were found, or 1 of 3 tested. Of these, 35 patients were treated for syphilis, including 2 children with congenital syphilis. Again, about half of the reactors had received adequate treatment for their infections prior to this survey. In addition, 3 males with gonorrhea applied for and received treatment.

### Other Migrant Workers

Many thousands of migrants other than the groups reported are tested each year in New Jersey. The State department of health has urged hotels, manufacturing industries, and others who employ migrants to perform the required health examinations. The result of this emphasis has been that a major share of the responsibility for examining migrant workers has been assumed by employers.

### Summary and Conclusions

In summary, the total number of migrants examined by the State department of health last year was 4,703, of which 1,006, or 21.4 percent, were reactive for syphilis. Of these sero-

positive and doubtful, 513 presented evidence of previous adequate treatment or were judged not to be infected with syphilis. Of those remaining, 326, including 11 cases with lesions, were given treatment, and 167 were lost to followup. In other words, approximately 1 in 5 migrants examined had a positive or doubtful test for syphilis and 1 in 14 received treatment. In addition, 137 patients with gonorrhea and 1 patient with chancroid were treated.

Results obtained in the survey of migrant laborers indicate that a very high incidence and prevalence of venereal disease still exists in the three groups examined—migrant agricultural, race track, and seafood industry workers—and that there can be no doubt of the necessity for continuing survey and treatment operations.

### REFERENCES

- (1) U. S. Department of Health, Education, and Welfare: Report of the East Coast Migrant Conference. Washington, D. C., The Department, 1954.
- (2) Shepard, A. C., and Page, W. J., Jr.: Venereal disease in agricultural migrants. Pub. Health Rep. 69: 831-835, September 1954.
- (3) Leone, L. P., and Johnston, H. L.: Agricultural migrants and public health. Pub. Health Rep. 69: 1-8, January 1954.
- (4) New Jersey Laws, 1945, c. 102. Approved April 7, 1945.

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## Sewage Treatment Plant Construction

Construction contracts for 169 projects to aid in stream pollution abatement were awarded by American cities in the first quarter of 1955. The contracts totaled \$59 million and covered 72 new plants and 97 additions, enlargements, or improvements for existing plants which provide treatment of sewage from municipalities, institutions, and other significant population centers.

# Chiropteran Rabies in Montana

By J. FREDERICK BELL, M.D., W. J. HADLOW, D.V.M.,  
and WILLIAM L. JELLISON, Ph.D.

A BAT was brought to the Rocky Mountain Laboratory of the Public Health Service by one of its employees on August 20, 1954. The bat, found in a flowerbed at the employee's home, revealed its presence by squeaking at approaching children. Suspecting a snake, the children called their father, who captured the bat without difficulty since it made no attempt to fly.

Upon cursory examination in the laboratory, it was apparent that the animal was weak. Since the bat vociferated when the children approached, it was probably irritable. After euthanasia with ether, the brain was removed and a suspension of approximately 10-percent concentration in serum-saline was prepared from one-half of the brain. Four mice were inoculated intracerebrally with 0.03-ml. portions of the suspension, and the remainder was frozen in sealed ampules. The other half of the brain was fixed in Zenker's fluid. After necropsy, the thoracic and abdominal viscera as well as the carcass were placed in 10-percent formalin.

On the 16th day after injection of brain suspension, 2 of the mice were found dead. The brains were removed, pooled, triturated in serum-saline, and dilutions of the suspension were used to inoculate other mice. The earli-

est signs of illness in the mice of this second passage were seen on the 11th day, and 6 mice injected with the  $10^1$  dilution were dead by the 14th day. A similar incubation period was observed in third-passage mice injected intracerebrally. A fourth passage by the intracerebral route resulted in a shorter incubation period in those mice injected with 10-percent supernate, inasmuch as the first signs of illness appeared on the 7th day and all 6 mice were dead by the 11th day. Typical Negri bodies were found in the brains of the mice from the first and second passages.

Virus in the bat brain was not titrated immediately, but at a later date some of the original frozen suspension was found to contain  $10^3 LD_{50}/0.03$  ml. The incubation period ranged from 14 to 19 days.

## Microscopic Findings

Histological sections of the bat brain stained by Lillie's buffered azure eosinate method revealed widespread regressive changes in the neurons as evidenced by their shrunken, distorted, and hyperchromatic appearance. The neuronal damage was most conspicuous in the thalamus and hypothalamus and in some areas of the cerebral cortex but was evident also in the hippocampal formation and in the Purkinje cells of the cerebellum. Inflammatory changes were not observed with the exception of a scanty lymphocytic accumulation around several meningeal vessels. There was moderate hyperemia of the meningeal and parenchymal vessels.

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Typical round and oval Negri bodies were found in the pyramidal cells of the hippocampus and the cerebral cortex (see fig.), in the Purkinje cells of the cerebellum, and occasionally in the nerve cells elsewhere in the brain. The inclusion bodies, however, were largest and most numerous in the hippocampus. The largest measured 3.5–4.0 microns in diameter and contained distinct basophilic granules usually situated centrally in the inclusion and often surrounded by a prominent hypochromatic ring or halo. Individual neurons frequently contained several smaller, cytoplasmic inclusion bodies, measuring 1–2 microns. Some of these small inclusions appeared to be uniformly eosinophilic. The Negri bodies were found in apparently unaltered cells as well as in those showing marked regressive changes.

Microscopic sections of heart, lung, liver, spleen, kidney, and small intestine showed no noteworthy changes.

### Identification of the Virus

In view of present widespread reports of rabies in Chiroptera (1), rabies was suspected when the first-passage mice became ill. The appearance of the sick mice and the finding of typical Negri bodies in mice and in the bat brain were evidence that the disease was rabies or a hitherto unknown lyssoid infection. Therefore, neutralization and protection tests, with known rabies serum, and cross-protection tests, using vaccines prepared from fixed rabies and from the putative virus, were done.

### Neutralization and Protection Tests

Antirabies serum was obtained from Dr. Karl Habel of the National Institutes of Health, Bethesda, Md. A serum used as a control was obtained from the blood of stock rabbits. These two serums were used in neutralization tests versus a laboratory strain of fixed rabies virus, the bat virus, and, in addition, a laboratory strain of western equine encephalitis virus which was included to establish the absence of nonspecific virucidal effects. At the time of the neutralization tests, only virus lots of low titer were available, and, therefore, the serums were tested against small doses of virus. However,



Large Negri body in a neuron of the hippocampus in the original bat brain, stained by azure eosinate ( $\times 2700$ ).

the results were clear-cut: The known antirabies serum in a 1:10 dilution gave complete protection against 50 LD<sub>50</sub> of the bat virus and 15 LD<sub>50</sub> of known rabies virus (the largest doses tested) but failed to protect against even 1 LD<sub>50</sub> of western equine encephalitis virus. The normal rabbit serum afforded no protection against any of the viruses. Refined and concentrated antirabies serum (Lederle) injected intraperitoneally in mice also protected the animals against both the bat virus and fixed rabies virus.

### Vaccine Protection Tests

Vaccines were prepared by the method of Habel, Bell, and Wright (2) from the brains of mice injected with the bat virus and infected with fixed rabies virus. Sufficient numbers of mice were injected with each vaccine (3) to permit cross-immunization tests with groups of 12 mice per dilution. Normal mice of the same age were challenged as controls. Unfortunately, the fixed rabies challenge and control titrations were done with dilutions of suspensions of brain tissue rather than with dilutions of supernate. However, the results clearly indicate that both vaccines afforded significant protection against homologous and heterologous challenge (see table).

A few vaccinated mice were challenged via the intraperitoneal route with 0.1 ml. of a  $10^1$  dilution of fixed rabies virus suspension. The results follow:

1. Normal mice (controls): 6 of 6 injected dead within 10 days.
2. Mice vaccinated with fixed rabies virus vaccine: 1 of 5 injected dead on the 2d day, and therefore apparently was not specific.
3. Mice vaccinated with bat virus vaccine: 1 of 6 injected dead on 10th day.

### Characteristics

In our limited experience with isolation of street virus, the long incubation period of this strain is unusual. Ernest Tierkel of the Communicable Disease Center, Atlanta, stated in a personal communication that a long incubation period is common in isolations from Florida bats but not in isolations from free-tailed bats (*Tadarida*) of the southwestern United States. The incubation periods in 3 rabbits injected intrathecally (cisternal puncture) with 0.2 ml. of a  $10^2$  dilution of the second mouse passage were 14, 15, and 24 days, respectively. Mice inoculated intracerebrally with 0.03 ml. of the same dilution became ill on the 10th day and all succumbed by the 15th day. A pool of brain tissue of the above rabbits was tested for virus content by titration in mice ( $10^2/0.03$  ml.) and 0.2 ml. was injected intrathecally into 4 rabbits. One rabbit died suddenly on the 15th day. One developed paralysis on the 30th day. The latter animal had much virus in the brain whereas another 1 of the 4, sacrificed the same day and apparently normal, had none. The 4th rabbit was alive 60 days after injection. None of the affected rabbits showed evidence of a furious

syndrome but developed rather sudden paralysis.

Mice that succumbed to infection usually developed paralysis in the hind quarters from one to several days before death. Seven mice injected with the virus developed the same paretic signs as many others injected at the same time but have not yet succumbed to the infection (45 days after injection) and appear to be in good health except for the paralytic sequelae which limit their movements. These animals are being studied further to establish, if possible, that they have survived active rabies infection.

### Identification of the Bat

The formalin-fixed bat specimen was transferred to 70 percent alcohol and sent to the Division of Mammals, United States National Museum, Washington, D. C. There it was identified as *Eptesicus fuscus pallidus* Young by Dr. David H. Johnson and accessioned as No. 298459 in the mammal collection. While the skull had been damaged by removal of the brain, the dentition and other characters permitted specific identification. The range of this sub-species extends from the Great Plains westward nearly to the Pacific Coast and from Canada to Mexico. Upon our inquiry and reexamination of the specimen, Dr. Johnson replied that there was "no reason to doubt that it is a native of your vicinity." The question arose because of the recent prior arrival from Ohio of a canvas-covered trailer which was parked in the neighborhood where the bat was captured.

*E. f. pallidus* is a large insectivorous bat which is not known to migrate but hibernates in caves in the northern States (4, 5). The known range of movement is from 33 to 61 miles in summer and winter, respectively. Engler (6) states that they are cannibalistic in captivity.

### Infection of Bats by Various Strains

Unfortunately, the identification of rabies in a bat came at a time when very few of the animals could be found in this area. Several reports of concentrations of bats were investigated, but in most cases only guano was present as evidence of previous habitation. A few ani-

Results of vaccine protection tests

Experiment No.	Vaccine	Challenge	Titer log LD <sub>50</sub>	Pro- tection log LD <sub>50</sub>
196				
A	Fixed rabies	Bat virus	<2.0	>2.75
B	Bat virus	do	<2.0	>2.75
C	do	do	4.75	
D	Fixed rabies	Fixed rabies	<2.00	>4.00
E	Bat virus	do	3.87	>2.13
F	do	do	>6.00	

imals, however, were recovered. Four specimens brought to the laboratory dead or which died soon afterwards were tested for rabies, but the virus was not demonstrated. Several other bats in good condition were maintained in the laboratory by feeding them on condensed milk and homogenized liver. Several of these (*E. f. pallidus*) were injected.

Bat 9194, injected intracerebrally with fixed virus, showed only mild irritability 25 days later. It was sacrificed that day and virus was detected by passage of brain tissue triturate to mice. It was notable that the incubation period of the disease in mice was several days longer than was usual for this strain. (It is possible, of course, that the bat was infected in nature before we collected it.) In the bat brain a few Negri bodies were seen in the pyramidal cells of the hippocampus but none in the Purkinje cells of the cerebellum.

Bat 9195, injected intracerebrally with bat virus (second mouse passage), showed tremors beginning on the 14th day. Weak, tremulous, ineffectual movements characterized the illness of this bat until it was sacrificed on the 25th day. Many small Negri bodies were noted in the hippocampus and multiple small Negri bodies in the Purkinje cells of the cerebellum. Inflammatory changes had occurred in the cerebral cortex and overlying meninges. The incubation period in mice injected with a suspension of brain from this bat was markedly shorter than in the case of bat 9194.

### Discussion and Summary

A virus isolated from a sick bat in western Montana has been identified as rabies virus. The virus was subjected to neutralization and protection tests with known antirabies serums, and to cross-protection tests with vaccines prepared from the bat virus and from fixed rabies virus. The results of those tests clearly indicated an antigenic relationship between the viruses. Because of small quantitative differences in cross-immunity tests, it appears that

the bat virus antigen may not be fully immunizing versus fixed rabies infection. This is the converse of the conclusions of Kubes and Gallia (7) in regard to chiropteran and Pasteur strains.

The incubation period of the disease in mice was prolonged in first passage but became shorter in serial passages. A titer of  $10^3$  LD<sub>50</sub>/0.03 ml. was found in the original brain suspension.

Typical Negri bodies were seen in the brain of the original bat and also in two bats injected intracerebrally, one with fixed virus and the other with bat virus.

The bat from which the virus was isolated has been identified as *Eptesicus fuscus pallidus*, an insectivorous species indigenous to western United States. This is the first reported isolation from the species, and the northernmost isolation from a bat. The source of infection in the bat is conjectural. Rabies has not been reported in Montana since 1952 according to H. F. Wilkins, Montana State veterinary surgeon. Bats of the species *Eptesicus fuscus* are known to hibernate, but whether they may also migrate is not established.

### REFERENCES

- (1) Courter, R. D.: Bat rabies. Pub. Health Rep. 69: 9-15, January 1954.
- (2) Habel, K., Bell, J. F., and Wright, J. T.: Benzene-inactivated rabies vaccine. Proc. Soc. Exper. Biol. & Med. 70: 455-457, March 1949.
- (3) Habel, K., and Wright, J. T.: Some factors influencing the mouse potency test for rabies vaccine. Pub. Health Rep. 63: 44-55, Jan. 9, 1948.
- (4) Toner, G. C.: A note on *Eptesicus fuscus*. J. Mammalogy 16: 147, May 1935.
- (5) Beer, J. R.: Survival and movements of banded big brown bats: J. Mammalogy 36: 242-248, May 1955.
- (6) Engler, C. H.: Carnivorous activities of big brown and pallid bats. J. Mammalogy 24: 96-97, February 1943.
- (7) Kubes, V., and Gallia, F.: Brain-tissue neutralization, a new biological reaction for rabies virus. Its relation to the protection and serum-neutralization tests. Bol. Inst. Invest. Vet. 1: 105-149, June 1943.

Observations in the vicinity of a central Texas cave inhabited by millions of Mexican free-tailed bats establish the presence of rabies in the bat population and suggest a hypothetical route of transmission to raccoons and other carnivores.

# Wildlife Rabies in Texas

## —A Preliminary Report—

By R. B. EADS, Ph.D., J. S. WISEMAN, M.S., J. E. GRIMES, B.A.,  
and G. C. MENZIES, M.S.

**R**ABIES is prevalent among Texas wild carnivore populations. In recent years the disease has been shown to occur in epizootic proportions in the gray fox, *Urocyon cinereoargenteus*, and skunks, chiefly *Mephitis mephitis* and *Spilogale* spp. (1).

In 1953 the Texas State Department of Health Laboratory confirmed positive findings of rabies in 150 foxes and 49 skunks taken from 44 and 20 counties, respectively. In 1954 it found rabies in 100 foxes and 71 skunks, from 33 and 29 counties, respectively. Occasionally,

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Dr. Eads is in charge of the entomology division, bureau of laboratories, Texas State Department of Health, which he joined in 1940. Mr. Wiseman and Mr. Grimes have been with the department since early 1953, Mr. Wiseman as an entomologist in the entomology division and Mr. Grimes as a virologist in the virus division, bureau of laboratories. Mr. Menzies is also a member of the entomology division. Their investigations on bat rabies in Texas have been supported in part by a research grant from the Division of Research Grants and Fellowships, National Institute of Mental Health, Public Health Service.

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the laboratory has received wolves, coyotes, raccoons, and bobcats which laboratory tests proved to be positive for rabies.

Since animals are seldom submitted for laboratory examination unless they have invaded premises, usually diurnally, and have attacked domestic animals or human beings, it would seem obvious that the actual level of rabies infection among wild carnivores is much higher than our data indicate.

The recovery of rabies virus from insectivorous bats in Florida by Venters and his associates (2) and again in several other States by other investigators led to consideration of the role of bats in the maintenance and spread of the disease in nature.

In Texas, interest has centered around the Mexican free-tailed bat, *Tadarida mexicana*, as a transmitter of rabies to men and domestic and wild animals because this species is the most abundant and widespread in the State and virologists in the State health department have repeatedly recovered the virus in its brain and salivary gland material. These bats are commonly observed in natural retreats and buildings, and in the central part of Texas they are especially prevalent in certain limestone caves during all but the coldest winter months.

The teeth of *T. mexicana*, although sharp, are short and delicate. Hence, the means whereby the rabies virus could be transmitted to a furred and thick-skinned carnivore, such as the fox, skunk, or raccoon, appear limited. Two natural methods of infection transmission appear feasible:

Live, infected bats which become moribund and fall to the floor of the bat retreat may be able to inflict bites around or inside the mouths of animals attempting to devour them.

The rabies virus from an infected bat, if eaten, may penetrate the mucous membrane of the oral cavity, throat, or esophagus through an abrasion already present or possibly through an abrasion caused by a sharp bone.

## Review of the Literature

Pursuant to the question of whether carnivores feed on bats, Allen (3) in his excellent book entitled "Bats," states, "Bats have few enemies." However, a search of the literature reveals an impressive list of mammals, as well as birds and reptiles, which feed on bats.

Campbell (4) tells of killing a "chicken snake" which had swallowed 14 bats from a colony in an old barn.

Davis (5) reports the recovery of a bat, *Molossus nigricans*, in good condition, which had been eaten by a rat snake, *Elaphe laeta*. We observed a colubrid snake consuming a free-tailed bat at the entrance of Ney Cave, near Bandera, Tex., in May 1954, but we do not know how the snake caught the bat. On another occasion, we saw a snake of comparable size and appearance at the same place, but it escaped into a rocky crevice before it could be collected.

Beer (6), Constantine (7), and Bailey (8) have recorded that predatory birds, such as hawks and owls, feed on bats, and on the Mexican free-tailed bat especially.

Sperry (9) recovered fragments of two silver-haired bats (*Lasionycteris noctivagans*) from the stomach contents of a skunk killed in January 1930, in Pisgah National Forest, North Carolina. At the same time and place, he also found a red bat, *Lasiurus borealis*, in the stomach of an opossum.

Taylor (10) in 1954 found that in Texas the red bat is a regular, although negligible, item

of the diet of the ringtailed cat, *Bassariscus astutus*, during the summer months. This nocturnal animal is arboreal and would probably take a greater number of solitary bats from the trees in which the bats spend the day if the bats were not also nocturnal.

Goodpaster and Hoffmeister (11) captured three minks having the remains of *Myotis* bats in their stomach contents. They took the minks in Carter County, Ky., at Carter Cave, which is inhabited by bats only during the winter months. These authors stated that the bats were hanging near enough to the cave floor for the minks to have reached them by jumping.

## Bat Rabies Investigations

As part of our overall bat rabies investigations in the Texas State Department of Health, we have made regular observations of one of the largest bat colonies in the United States, in Bracken Cave near San Antonio. Only about 1,000 feet long, from 40 to 100 feet wide, and from 30 to 75 feet high, the cave harbors a multimillion population of *T. mexicana* and an appreciable number of *Myotis velifer* except for certain of the winter months.

During December through January there were no bats at all in the cave. Presumably, the free-tailed bats migrate south, possibly into Mexico, during the winter season and thus come within the range of the vampire bat. Just how far southward *T. mexicana* travels has yet to be determined.

In an effort to learn more about the ecology of this species, 3 of us banded approximately 5,000 individuals during 5 trips to the study cave in September and October 1954. During March-May 1955, approximately 10,000 more bats, chiefly *T. mexicana*, have been banded in this and other central Texas bat caves.

We used insect nets with extension handles for raking the bats off the walls and ceilings of the cave and placed the captured bats in an apple box, the top and bottom of which we covered with screen wire, adding a sliding panel door to the top. When a box contained a few hundred bats, it was taken to the cave entrance for banding.

Using the banding method described by Trapido and Crowe (12), we placed zero-sized





Entrance to one of the bat caves in central Texas where the State health department is conducting rabies transmission and migration studies.

aluminum bird bands on the distal portion of the forearm and adjusted the bands to permit free sliding along the bone without pinching the wing membrane. The United States Fish and Wildlife Service supplied the bird bands.

We found that one person could fasten the bands, pinching them together, as rapidly as two others, wearing leather gloves, could remove the bats from the box and hold out the forearm for banding.

Working during the summer months in these caves is very unpleasant because the guano is more than a foot deep in spots, ammonia fumes are strong, ectoparasites are abundant, and the heat is intense.

Regular monthly collections of bats have been made from the study cave for laboratory examinations.

The table illustrates the frequency with which

the virus of rabies was isolated from brains and salivary glands of *T. mexicanus*. Our laboratory has processed 329 bats of this species from Bracken Cave, collected from May 1954 through April 1955 in 98 pools. Twelve of the pools contained the rabies virus.

The specimens used for the pools were bats which were taken with the aid of insect nets from the cave walls or in flight or they were found moribund on the floor of the cave.

Our studies demonstrated that there may have been a high level of rabies infection in the free-tailed bats during May 1954–April 1955. That the colony had an extremely high mortality rate was evidenced by the fact that the cave floor was covered with dermestid beetle larvae and adults which devoured fallen bats. The maintenance of such an enormous dermestid population would require an appreciable supply



**Rabies isolations from *Tadarida mexicana* taken in Bracken Cave, in central Texas, in 1954 and 1955**

Date collected <sup>1</sup>	Number of bats	Number of pools	Number of positive pools	Source of virus
<b>1954</b>				
May 6-----	35	3	2	Brain and salivary glands.
June 29-----	37	5	1	Brain.
July 30-----	35	7	4	Brain and salivary glands.
Aug. 30-----	44	8	2	Do.
Sept. 21-----	27	6	2	Do.
Oct. 8-----	45	8	0	
Nov. 19-----	46	21	0	
<b>1955</b>				
Feb. 23-----	25	25	0	
Mar. 14-----	10	10	0	
Apr. 27-----	25	5	1	Do.
Total-----	329	98	12	

<sup>1</sup> During December 1954 and January 1955 there were no bats in the cave.

of dead bats. Skeletal remains of bats in the guano were abundant throughout the cave.

Our earliest observations during the spring of 1954 confirmed Constantine's report for the National Speleological Society (7) that the bat caves in central Texas attract large numbers of predatory mammals and birds. We found that raccoons, in particular, were far more abundant around the study cave than the food supply appeared to justify, unless they were feeding on bats. Large accumulations of raccoon feces were in evidence at the mouth of the cave throughout the summer, but raccoon tracks or droppings were not found within the cave. The droppings found at the entrance to the cave did not contain any bat skin or bones.

It was not until November 18, 1954, after most of the bats had departed from the cave, that we had definite evidence of raccoons eating bats in numbers. When we noticed that raccoon tracks were abundant throughout the cave, we searched for concentration of scats (feces). Several recently deposited accumulations of fecal material contained bat fur and bones; some of the scats contained nothing but the remains of 5 to 10 bats, but others also con-

tained insect fragments and seeds of the black persimmon, a major item of the raccoon diet during the summer.

We were surprised to find in one of the scats an aluminum band still attached to a portion of bat fur and forearm. We identified the band as having come from a free-tailed bat banded in the study cave on September 29, 1954.

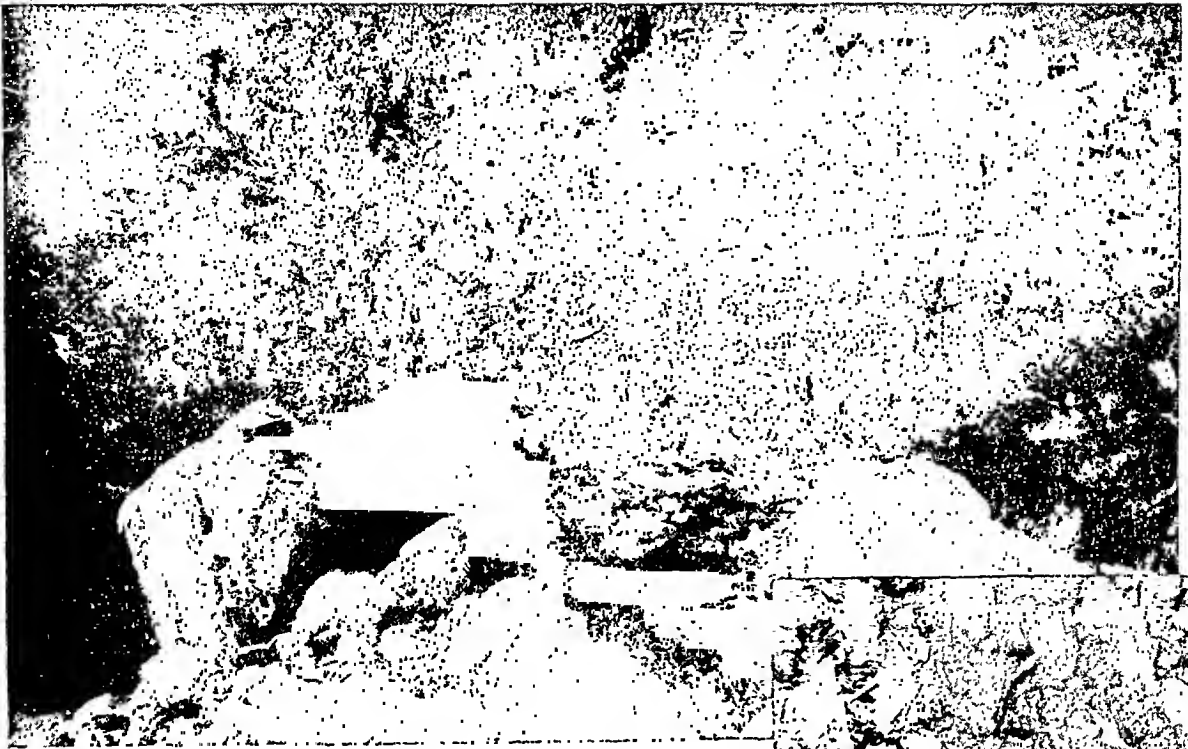
Migration had reduced the colony by November 1954 to a few thousand bats, hanging night and day from the highest ceiling area at the rear of the cave. With the advent of cold weather, the bats appeared to have discontinued their evening feeding flights, thus giving a raccoon or other carnivore little chance of reaching a bat unless it fell to the floor.

Early in December 1954 we baited 6 live traps with sardines and raw hamburger and set them in the study cave in order to collect raccoons for our bat-to-carnivore rabies transmission experiments. The first night of trapping produced 1 raccoon (*Procyon lotor*) and 2 damaged traps from which the raccoons had escaped. The second night we took 2 more raccoons from 4 traps within the cave. On the third night we baited 2 traps and took another raccoon. These animals freely fed on bats in the laboratory.

On April 28, 1955, large quantities of rac-



**Banding Mexican free-tailed bats at a cave entrance.**



**Guano-encrusted rocks on the floor of a bat cave.**

**Right: Closeup of bats on the wall.**



coon feces were again noted at the entrance of Bracken Cave. These were composed largely of bat skin and skeletal material.

### **A Hypothetical Explanation**

The abundance of the raccoons and other carnivores in the vicinity of the large bat caves of central Texas strongly indicate that these animals occasionally feed on bats which fall near the cave entrances during the spring and late summer months.

Our observations show that in the autumn and spring, when other foods, and particularly the black persimmon, become less abundant or absent, raccoons enter the caves and actively search for fallen bats. For a limited period of time bats are an important dietary item of the raccoon in these restricted areas. Thus the possibility of the transmission of rabies from bats to these carnivores exists, but the exact mode of this potential interspecies transmission remains to be demonstrated.

Our investigations have established the isolation of the rabies virus from 12 out of 98 pools containing 329 bats during the period from May 6, 1954, to April 27, 1955, but the virus was not found in 64 pools containing 126 bats collected from October 1954 through March 1955. It seems probable that the presence of the disease might help to account for the number of bats that fall to the floor of the cave and serve as food for the raccoons.

This relationship provides a hypothetical explanation of the way in which rabies might pass from bats to raccoons. Evidence from the literature indicates the possibility of similar transfer to ringtailed cats, skunks, opossums, and other animals. However, the mechanism of transfer has not been found.

## Summary

Investigators in the Texas State Department of Health report observations of a close association between Mexican free-tailed bats (*Tadarida mexicana*) and certain carnivores, especially the raccoon. During November 1954 and April 1955 they examined a number of raccoon droppings found within a central Texas cave inhabited by a colony of the free-tailed bats. The droppings were composed largely of bat fur and bone. The State health department laboratory has demonstrated a high level of rabies infection in the bat population within the study cave. Transmission of the rabies virus to raccoons and other carnivorous animals through the agency of infected bats is being investigated.

## REFERENCES

- (1) Irons, J. V., Eads, R. B., Sullivan, T., and Grimes, J. E.: The current status of rabies in Texas. *Tex. Rep. Biol. & Med.* 12: 489-499, Fall 1954.
- (2) Venters, H. D., Hoffert, W. R., Scatterday, J. E., and Hardy, A. V.: Rabies in bats in Florida. *Am. J. Pub. Health* 44: 182-185, February 1954.
- (3) Allen, G. M.: Bats. Cambridge, Mass., Harvard University Press, 1940, ch. 18.
- (4) Campbell, C. A. R.: Bats, mosquitoes and dollars. Boston, Stratford Co., 1925, 262 pp.
- (5) Davis, W. B.: Bat, *Molossus nigricans*, eaten by the rat snake, *Elaphe laeta*. *J. Mamm.* 32: 219, May 1951.
- (6) Beer, J. R.: The screech owl as a predator on the big brown bat. *J. Mamm.* 34: 384, August 1953.
- (7) Constantine, D. C.: Great bat colonies attract predators. In *The caves of Texas*. National Speleological Society Bull. No. 10. Washington, D. C., National Speleological Society, 1948, 136 pp.
- (8) Bailey, V.: Bats of the Carlsbad Caverns. *Nat. Geog. Mag.* 48: 321-330, September 1925.
- (9) Sperry, C. G.: Opossum and skunk eat bats. *J. Mamm.* 14: 152-153, May 1933.
- (10) Taylor, W. P.: Food habits and notes on life history of the ringtailed cat in Texas. *J. Mamm.* 35: 55-63, February 1954.
- (11) Goodpaster, W., and Hoffmeister, D. F.: Bats as prey for mink in Kentucky cave. *J. Mamm.* 31: 457, November 1950.
- (12) Trapido, H., and Crowe, P. E.: The wing banding method in the study of the travels of bats. *J. Mamm.* 27: 224-226, August 1946.

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## Memorial to Dr. T. Duckett Jones

Support of young investigators and long-range medical research is promised by a fund recently established in honor of Dr. T. Duckett Jones, who died in 1954.

Jones was medical director of the Helen Hay Whitney Foundation, which is cooperating with the memorial committee. He advocated the creation of long-tenure positions for experienced investigators in universities and research institutions and aid to carefully selected, unrecognized researchers which might permit them to demonstrate their competency. His ideas and suggestions influenced research programs of a number of American institutions, including the National Institutes of Health and the American Heart Association.

The committee feels that research in rheumatic fever, the subject of much of Jones' own research activity, should be given first consideration in the assignment of its resources, but not an exclusive claim.

Mrs. James B. Campbell is chairman of the committee. Other members are Dr. E. Cowles Andrus, Dr. Walter Bauer, Dr. Francis L. Chamberlain, Mrs. Albert D. Lasker, Dr. H. M. Marvin, Dr. Jean Jones Perdue, Dr. David D. Rutstein, Dr. Leonard A. Scheele, Dr. Frederick K. Trask, and Dr. Paul D. White.

*The incidence of Trichinella spiralis in the area of Louisville-Jefferson County, Ky., as determined by examining the diaphragms of humans autopsied at the Louisville General Hospital and of swine slaughtered in the Louisville abattoirs.*

# Trichinella spiralis in the Diaphragms of Humans and Swine

By LETITIA S. KIMSEY, M.D., and STUART L. ADAMS, Ph.D.

INTEREST in the control of trichinosis as a public health measure was awakened by the First National Conference on Trichinosis in 1952, and an amended recommendation of the 1954 Conference on Trichinosis (1) emphasized the continuing importance of data on the prevalence of this disease. The amended recommendation stated:

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*Dr. Kimsey is assistant professor of microbiology, and Dr. Adams is a research associate in the department of microbiology, University of Louisville School of Medicine, Louisville, Ky. Dr. Adams is also director of research at Joseph E. Seagram & Sons, Inc.*

*Individual reports of the investigation described have been submitted to the Graduate School of the University of Louisville in partial fulfillment of requirements for the degree of master of science. Dr. Kimsey's report, "The incidence of infestation with Trichinella spiralis as revealed by the examination of 570 diaphragms at the Louisville General Hospital, Louisville, Ky.," was submitted in 1943; Dr. Adams' report, "The incidence of Trichinella spiralis in the diaphragms of swine from the Louisville abattoirs," in 1942.*

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"Because of the advantages of having up-to-date information concerning the incidence of trichinosis in man, and in view of a decreased incidence of trichinous infection encountered in swine, the United States Public Health Service is requested to repeat the random survey of human trichinosis carried out by that agency between 1936 and 1941."

Even though the study here reported was conducted a decade ago, the data should be useful statistically since there are no published data on the incidence of trichinosis in either the human or porcine population of Kentucky.

## Materials and Methods

Using essentially the same methods, one author investigated the incidence of *Trichinella spiralis* in the diaphragms of humans and the other studied the incidence of the parasite in the diaphragms of swine.

### *Study of Human Diaphragms*

The material used in the study of infestation of humans consisted of a series of diaphragms removed at routine autopsy at the Louisville General Hospital, Louisville, Ky. Except for the exclusion of diaphragms of children under

1 year of age, there was no conscious selection of subjects. The investigation was divided into two series and the results were interpreted and reported separately.

Series 1 consisted of 311 diaphragms placed directly in 10 percent formalin when removed from the body and later examined by a modification of the direct microscopic method employed by Nolan and Bozicevich (2). A gram of muscle from which tendinous material had been removed, taken at random from various parts of the diaphragm, was teased into pieces and firmly pressed between two glass plates. The positive findings were recorded in terms of trichinae per gram of diaphragm as revealed by the examination of the pressed preparation, using a wide-field microscope with a 12.5 ocular and a 1.7 objective.

Series 2 consisted of 259 diaphragms which were examined by both the direct microscopic and the digestion techniques. The diaphragms were removed at routine autopsy and kept in jars of fresh water at icebox temperature until time of examination. The specimens were then carefully dissected, and four 1-cm.-wide strips taken from different locations on the circumference of the diaphragm were cut parallel to the direction of the muscle fibers, care being taken to include the tendinous insertions. The strips were placed in 10 percent formalin, and all four were examined later by the direct microscopic method employed in series 1.

The digestion method used was a modification of the digestion-Baermann technique described by Queen (3) in 1931. The portion of the diaphragm that remained after the material for the direct microscopic examination had been removed was finely ground and digested by artificial gastric juice, which consisted of 0.5 percent hydrochloric acid and 0.7 percent commercial pepsin in an aqueous solution. A liter of this digestion material was added to approximately 50 gm. of the ground muscle, and the mixture was simultaneously agitated mechanically and incubated at 37° C. for a period of 12 hours. The mixture was allowed to settle for an equal period of time, and the sediment then was filtered through cheesecloth and later through a No. 3 Coors porcelain desiccator plate placed in a funnel. The sediment from this filtration was centrifuged and the deposit was

poured into a Petri dish for microscopic study with a dissecting microscope with a 20-diameter magnification. There was no quantitative report as to the larvae per gram of digested diaphragm. The detection of larvae in any fraction of the centrifuged sediment constituted a positive finding.

### *Study of Swine Diaphragms*

One thousand swine diaphragms were taken by random selection immediately prior to Government inspection of the viscera of the animals. These diaphragms were collected from 4 abattoirs over a period of 9 months in order to insure representative sampling of the swine slaughtered in the Louisville market.

**Table 1. Human diaphragms positive for *Trichinella spiralis* by direct microscopic method only (series 1)**

Serial No.	Age (years)	Sex	Race	Eosinophils in blood (percent)	Cysts per gram of diaphragm
1-----	16	M	W	0	1
2-----	59	M	N	2	1
3-----	29	F	N	N. D.	4
4-----	40	F	N	0	13
5-----	74	M	W	0	1
6-----	46	F	W	0	4
7-----	64	F	N	0	51
8-----	34	F	N	0	1
9-----	39	M	N	N. D.	2
10-----	67	M	W	0	1
11-----	57	M	N	0	2
12-----	55	M	N	N. D.	3
13-----	61	M	W	0	2
14-----	58	F	N	1	75
15-----	68	M	N	0	6
16-----	60	F	N	N. D.	4
17-----	39	F	N	0	4, 500
18-----	72	F	W	0	3
19-----	34	M	W	N. D.	1
20-----	40	M	W	N. D.	2
21-----	59	M	N	N. D.	2
22-----	71	M	W	N. D.	4
23-----	37	M	N	1	3
24-----	79	M	N	2	3
25-----	61	M	W	N. D.	1
26-----	30	M	N	0	2
27-----	60	M	N	N. D.	408
28-----	79	M	N	0	5
29-----	49	F	N	0	1
30-----	54	M	W	0	3
31-----	74	F	W	0	8
32-----	36	M	W	0	1
33-----	62	F	W	1	1
34-----	71	M	W	1	3
35 <sup>1</sup> -----					3

N. D. No blood count made.

<sup>1</sup> Tag lost, diaphragm saved.

The method of preservation of the swine diaphragms was the same as that employed for human diaphragms. The diaphragms were examined by both the direct microscopic and the digestion techniques. In the direct microscopic examination, the fascia was removed from the diaphragm, and one-half gram of muscle taken from various parts of the organ was cut into small thin strips and examined in the manner described for the human diaphragms.

The digestion method employed early in the study of the swine diaphragms was the previously described modification of the Baermann technique. All of the diaphragm that remained after the sample for the direct microscopic study had been removed was ground and digested in 3 liters of the artificial gastric juice for 24 hours at 37° C., with constant mechanical agitation. There was no other modification of the technique. However, after 107 diaphragms had been examined, the mass digestion procedure of Hood and Olsen (4) was adopted. The diaphragms were stripped of the tendon and fat and 10-gram portions from each of 10 or 20 diaphragms were digested together. The remainder of each diaphragm was retained so that the specimens might be examined individually if larvae were found in the mass digestion. One liter of artificial gastric juice was used to digest 50 gm. of diaphragm.

## Results

### Human Diaphragms

*Series 1.* Of the 311 human diaphragms examined by the direct microscopic method alone, 35 (11.2 percent) were found to contain *Trichinella spiralis*. The more important data concerning the group are shown in table 1.

The density of infestation varied from 1 cyst per gram to 4,500 cysts per gram of diaphragm.

The ages of the patients varied from 1 to 88 years. Of the 311 diaphragms examined, 99 (31.8 percent) were from persons less than 40 years of age at death; 188 (60.5 percent) were from persons dying at between 40 and 80 years of age; and 3 (0.9 percent) were from persons over 80 years of age. The ages of 21 individuals (6.8 percent) were unknown. These persons were dead upon arrival at the hospital—in

most instances, coroner's cases—or they died before a history could be obtained.

The age distribution of the patients with *T. spiralis* infestation is shown in table 2. Of the 23 diaphragms of patients in the first two decades of life, only 1, that of a boy 16 years of age, showed presence of trichinae. Four percent of the group aged 20–29 years and 8.1 percent of the group aged 40–49 years revealed infestation with *T. spiralis*. In each of the other decades (through the seventh), the incidence of infestation was over 13 percent. The highest incidence (18.4 percent) fell in the group aged 70–79 years. The highest percentage (22.8) of the 35 positive cases fell in the group aged 60–69 years.

The incidence of trichinosis by race and sex of the patients is recorded in table 3. Of the 311 diaphragms examined, 184 were from males and 108, from females. The race and sex of 19 patients were not recorded. Twenty-two (11.9 percent) of the 184 males and 12 (11.1 percent) of the 108 females were infested with trichinae. One positive diaphragm was found among the 19 patients of unknown race and sex. Of the 292 persons whose race and sex were recorded, 171 were white, 14 (8.2 percent) being infested with trichinae. Twenty (16.5 percent) of the 121 Negro patients harbored encysted larvae. The highest incidence of in-

Table 2. Results of examination of human diaphragms for *Trichinella spiralis* by direct microscopic method only (series 1), by age distribution of patients

Age (years)	Number diaphragms examined	Positive		
		Number	Percent	Percent of total positives
1-9	11	0	0	0
10-19	12	1	8.3	2.9
20-29	25	1	4.0	2.9
30-39	51	7	13.7	20.0
40-49	49	4	8.1	11.4
50-59	45	6	13.3	17.1
60-69	56	8	14.2	22.8
70-79	38	7	18.4	20.0
80 and over	3	0	0	0
Unknown <sup>1</sup>	21	1	4.7	2.9
Total	311	35	11.2	100.0

<sup>1</sup>Tags lost, diaphragm saved.

festation (18.1 percent) occurred in Negro males; the lowest (7.5 percent), in white females. The white males showed an incidence of 8.4 percent; the Negro females, 14.5 percent.

*Series 2.* Of the 259 diaphragms examined by both the direct microscopic and digestion methods, 54 (20.8 percent) showed the presence of *T. spiralis*. Of these 54 positive cases, 13 (24.1 percent) were not detected by the digestion method and 7 (12.9 percent) were not revealed by the direct microscopic method. Thirty-four (63.0 percent) were positive by both methods. By the digestion method, 41 (15.8 percent) of the total diaphragms were positive; by the direct microscopic method, 47 (18.1 percent). Of the total positives, 75.9 percent were detected by the digestion method and 87.0 percent by the direct method.

The more important data concerning these positive cases are shown in table 4.

The density of infestation as determined by the direct microscopic method varied from 2 cysts per gram to 73 cysts per gram of diaphragm. Since the modified digestion-Baermann technique was not carried out quantitatively, it was assumed that if the direct microscopic test on a diaphragm failed to reveal any organisms and trichinae were found by the digestion technique, the diaphragm contained less than two cysts per gram.

The ages of the patients in this series varied from 1 to 86 years. Of the diaphragms examined, 70 (27.0 percent) were from persons less than 40 years of age; 174 (67.2 percent) were from persons dying between 40 and 80

**Table 3. Incidence of *Trichinella spiralis* in human diaphragms examined by direct microscopic method only (series 1), by sex and race of patient**

Sex and race	Number diaphragms examined	Infested	
		Number	Percent
Total.....	311	35	11.2
Male.....	184	22	11.9
White.....	118	10	8.4
Negro.....	66	12	18.1
Female.....	108	12	11.1
White.....	53	4	7.5
Negro.....	55	8	14.5
Unknown.....	19	1	5.2

**Table 4. Human diaphragms positive for *Trichinella spiralis* by both the direct microscopic and modified digestion-Baermann methods (series 2)**

Serial No.	Age	Sex	Race	Eosinophils in blood (percent)	Direct microscopic method (cysts per gram of diaphragm)	Modified digestion-Baermann method
1.....	60	F	N	0	15	Positive
2.....	68	F	N	N. D.	20	Do.
3.....	86	M	N	N. D.	8	Negative
4.....	59	M	N	2	4	Positive
5.....	68	F	N	0	70	Do.
6.....	66	M	N	0	5	Do.
7.....	44	F	N	0	10	Negative
8.....	53	M	W	0	2	Do.
9.....	37	M	W	0	2	Do.
10.....	57	F	W	0	4	Do.
11.....	55	F	W	0	2	Positive
12.....	49	F	W	0	2	Negative
13.....	66	M	W	1	4	Do.
14.....	54	M	W	2	0	Positive <sup>1</sup>
15.....	57	F	W	1	0	Do. <sup>1</sup>
16.....	64	M	N	0	4	Positive
17.....	67	M	W	1	34	Do.
18.....	44	F	W	3	4	Negative
19.....	45	F	N	2	10	Positive
20.....	40	M	W	0	38	Negative
21.....	45	F	N	0	0	Positive <sup>1</sup>
22.....	52	M	W	1	4	Positive
23.....	60	F	N	N. D.	4	Do.
24.....	70	M	N	N. D.	40	Do.
25.....	83	M	W	N. D.	4	Do.
26.....	82	F	W	0	6	Do.
27.....	65	M	N	0	2	Do.
28.....	29	F	W	0	10	Do.
29.....	51	M	W	4	0	Positive <sup>1</sup>
30.....	65	M	W	N. D.	4	Positive
31.....	73	F	W	0	73	Do.
32.....	71	M	W	0	3	Do.
33.....	67	F	W	0	2	Negative
34.....	72	F	N	0	4	Do.
35.....	56	M	W	N. D.	4	Positive
36.....	68	M	N	N. D.	0	Positive <sup>1</sup>
37.....	68	F	W	1	0	Do. <sup>1</sup>
38.....	73	M	W	0	8	Positive
39.....	67	M	W	1	3	Do.
40.....	57	F	W	0	6	Do.
41.....	34	M	W	3	2	Do.
42.....	67	M	W	N. D.	3	Do.
43.....	34	M	N	0	6	Do.
44.....	50	M	N	N. D.	7	Do.
45.....	47	M	N	1	0	Positive <sup>1</sup>
46.....	54	M	N	N. D.	14	Positive
47.....	32	M	W	0	14	Negative
48.....	37	F	N	0	2	Do.
49.....	17	M	W	0	5	Positive
50.....	30	M	N	0	3	Do.
51.....	26	F	W	0	10	Do.
52.....	76	F	W	0	21	Do.
53.....	75	M	N	N. D.	32	Do.
54 <sup>2</sup> .....					11	Do.

N. D.=No blood count made.

<sup>1</sup> Less than 2 cysts per gram. <sup>2</sup> Tag lost, diaphragm saved.



years of age; and 6 (2.3 percent) were from persons over 80 years of age. The ages of 9 individuals (3.5 percent of the 259) are unknown. They were dead upon arrival at the hospital or died before a history could be obtained.

The ages of patients in this series are shown by decades in table 5. Only 1 diaphragm of the 25 examined from persons in the first two decades of life contained trichinae. This was a diaphragm of a white male 17 years of age. In the other seven decades of life the lowest percentage of positives was 13.3 percent, in the 20-29-year age group. Fifty percent, 3 of the 6 cases in the 80-89-year age group were positive. Of the 54 positive cases, the highest incidence (25.9 percent) was in the 60-69-year age group.

**Table 5. Results of examination of human diaphragms for *Trichinella spiralis* by both direct microscopic and modified digestion-Baermann methods (series 2), by age distribution of patients**

Age (years)	Number diaphragms examined	Positive		
		Number	Percent	Percent of total positives
1-9.....	13	0	0	0
10-19.....	12	1	8.3	1.8
20-29.....	15	2	13.3	3.7
30-39.....	30	6	20.0	11.1
40-49.....	40	7	17.5	13.0
50-59.....	53	12	22.6	22.2
60-69.....	51	14	27.4	25.9
70-79.....	30	7	23.3	13.0
80 and over.....	6	3	50.0	5.6
Unknown <sup>1</sup> .....	9	2	22.2	3.7
Total.....	259	54	20.8	100.0

<sup>1</sup> Tags lost, diaphragms saved.

The incidence of trichinae by sex and race of the patient is recorded in table 6. Of the 259 cases examined, 182 were males and 72, females. The sex and race of 5 patients were not recorded. Of the 182 males examined, 31 (17.0 percent) were infested with trichinae. Twenty-two (30.5 percent) of the 72 females were found to be parasitized. One positive diaphragm occurred among the five patients of unknown sex and race. Of the 254 persons whose sex and race were recorded, 154 were

white, and 31 (20.1 percent) of these were infested with *T. spiralis*.

Twenty-two percent of the 100 Negro patients harbored encysted trichinae. The highest incidence (33.3 percent) occurred in white females; the lowest incidence (15.6 percent), in white males. The Negro males showed an incidence of 19.4 percent and the Negro females, 27.2 percent.

A differential blood count was performed in 24 of the 35 patients whose diaphragms were examined in series 1 (table 1). Of these 24 patients, only 6 showed eosinophils, the greatest number in any patient being 2.0 percent of the total count. Of the 41 patients in series 2 whose diaphragms contained trichinae and upon whom a differential blood count was made, only 13 were found to have eosinophils. The highest incidence was 4.0 percent. There were no eosinophils in 28 of the 41 patients.

### Swine Diaphragms

Of the 1,000 swine diaphragms examined, only 2 were found to contain trichinae by the digestion method and 1, by the direct microscopic method. The one specimen found positive by direct examination was also positive by digestion. Thus, the incidence of infestation in the group studied was 0.2 percent.

### Discussion

The human diaphragms used in this study were removed at routine autopsy at the Louis-

**Table 6. Incidence of *Trichinella spiralis* in human diaphragms examined by both direct microscopic and modified digestion-Baermann methods (series 2), by sex and race of patient**

Sex and race	Number diaphragms examined	Infested	
		Number	Percent
Total.....	259	54	20.8
Male.....	182	31	17.0
White.....	115	18	15.6
Negro.....	67	13	19.4
Female.....	72	22	30.5
White.....	39	13	33.3
Negro.....	33	9	27.2
Unknown.....	5	1	20.0



ville General Hospital, Louisville, Ky. Aside from the exclusion of children under 1 year of age, there was no selection of specimens by age, sex, race, occupation, or clinical history of the patients. The presence of the organism was not suspected clinically in any of the 89 individuals who harbored cysts. Several patients gave vague histories of rheumatism or "growing pains" but these symptoms could well be attributed to some condition other than infestation with trichinae. Schwartz (5) explains in his article on the occurrence, significance, and control of trichinosis that the presence of trichinae in the diaphragm at autopsy does not mean that the person necessarily had previously existing clinical trichinosis. Those persons with relatively few trichinae per gram of diaphragm probably experienced little, if any, inconvenience, and their medical histories would not suggest the symptoms characteristic of the clinical entity called trichinosis. Schwartz states that these light infections have only zoological significance, and the surveys demonstrate that trichinae is consumed in pork eaten by the public and that many Americans eat insufficiently cooked or inadequately cured pork.

By the direct microscopic method, 35 (11.2 percent) of the 311 diaphragms of series 1 were found to contain *T. spiralis*, and 47 (18.1 percent) of the 259 diaphragms of series 2 were positive. When subjected to statistical analysis, however, the difference in incidence of trichinae in the two series was insignificant.

There was a marked difference in the incidence of infestation with trichinae in the human diaphragms as determined by the direct microscopic examination in series 1 and that detected by the combination of the direct microscopic and the modified digestion-Baermann methods in series 2. This discrepancy between results of the direct microscopic method and the digestion method is to be expected from the work of Hall and Collins (6), who found that either method alone failed to detect trichinae in a certain number of cases. This fact has been supported by the findings of Nolan and Bozicevich (2), who stated that the microscopic method failed in a number of cases of light infestation. Conversely, the digestion method was reliable in detecting even very light infes-

tations, although it was valueless in detecting dead trichinae.

The 20.8 percent of human infestation with trichinae as determined by the combined direct microscopic and modified digestion-Baermann tests is rather high for this area of the country. The southern States have, according to other investigators, a much lower incidence of trichinosis than that reported in other geographic sections of the United States. Hinman (7) in 1936 reported that 7 (3.5 percent) of 200 diaphragms from human autopsies at the Charity Hospital, New Orleans, La., were positive for trichinae when examined by the digestion method.

Sawitz (8), in a study of 200 autopsies from the Touro Infirmary and Charity Hospital, New Orleans, found that 5.0 percent contained *T. spiralis*. The diaphragms and pectoral muscles were examined by the compression and digestion methods. Two years later, in 1939, Sawitz (9) published an article on the incidence of trichinosis in man, dogs, and cats in the New Orleans area. In addition to the 200 cases just described, his study included material from 200 unselected routine autopsies of patients from the same institutions. Essentially, the same methods of examination were employed. Of the 400 cases, larvae of *T. spiralis* were found in 24, an incidence of 6.0 percent in the human population of the New Orleans area.

Meleney (10), in 1941, reported that among 209 human diaphragms from persons who died at the Vanderbilt University Hospital and the Nashville General Hospital, in Nashville, Tenn., 10 percent were positive for *T. spiralis* when examined by the combined digestion and microscopic press methods. However, in a preliminary report on the incidence of trichinosis in Alabama, Walker and Breckenridge (11) in 1938 reported that they had examined the diaphragm, intercostal, pectoral, and rectus abdominis muscles from 100 patients at autopsy by the digestion and press methods and found an incidence of 33 percent.

In 1943, the results of a very extensive survey of the incidence of *T. spiralis* in the population of the United States were published by Wright, Kerr, and Jacobs (12). Diaphragms were examined from a total of 5,313 individuals coming

to necropsy in 189 hospitals located in 114 cities in 37 States and the District of Columbia. These diaphragms were examined by both the direct microscopic and the digestion-Baermann methods. Of these 5,313 diaphragms, 855 (16.1 percent) were positive for *T. spiralis*. Omitting results of examination in a series of 200 diaphragms from persons of Jewish faith, of which only one was positive, the representative cases totaled 5,113, of which 854 (16.7 percent) were positive. Several papers in the series contained summaries of the finding of trichinae in surveys conducted by other investigators already referred to in this article. Although no statistics were given for Kentucky, the State was included in the East South Central group with Tennessee, Alabama, and Mississippi. Of the total 5,313 diaphragms examined, 85 were from this area and 15 (17.6 percent) of these were positive for trichinae. However, the interpretation was to the effect that, on the basis of this small number of cases, conclusions could not be drawn as to the probable incidence of human infection with trichinae in these areas.

Even though trichinosis has been a reportable disease in Louisville since 1917, an examination of the Louisville and Jefferson County Health Department records for the past 20 years failed to disclose a single case.

The low incidence of trichinosis in the south is explained by the fact that the majority of hogs in that area are peanut or grain fed, whereas many of those in more densely populated sections of the country are garbage fed. Hall (13) stated that the incidence of trichinae in swine is approximately as follows: Pasture-raised swine, mostly in the midwest, are free or practically free from trichinae. The so-called grain-fed swine in the midwest are in reality a mixture of some pasture-raised and some garbage-fed swine, and the mixture has an average infestation of about 1.5 percent. Southern swine have an average infestation of less than 1 percent. Garbage-fed hogs, which are more numerous along the southern part of the Pacific coast and the northern part of the Atlantic coast, have an average incidence of about 5 percent. The last group, which has practically disappeared, is the offal-fed hog, which has the highest incidence of infestation, about 18 percent.

The swine examined in the present study would be classified by Hall and others as grain fed, for, although the exact feeding could not be determined precisely, these swine were raised in a section of the country in which grain feeding predominates and were purchased for slaughter in the belief that they had been grain fed. It is estimated that approximately 50 percent of the swine were raised within a 100-mile radius of Louisville and that the remaining 50 percent were predominantly from north central Indiana and Illinois. The 0.2 percent infestation found in these swine is lower than the average given by Hall. However, similarly low incidences have been found in some other surveys. For example, Kerr (14) found 3 cases of infestation in a group of 566 grain-fed swine examined, and Cameron (15) in 1940 reported 2 positives in a group of 995 swine examined in Canada. It is evident that with such a small number of positives a difference of several tenths of 1 percent is not significant.

In 1953, Schwartz (5) reported a survey conducted over a 3-year period in which the diaphragms of 3,031 hogs from the midwest (Corn Belt hogs) were examined by the digestion method and 19 (0.63 percent) were found to harbor trichinae. The direct microscopic examination of small samples from a fairly large proportion of these diaphragms gave consistently negative results. The maximum number of parasites recovered from any diaphragm was between 7 and 8 per gram, most containing only 5 trichinae per 1,000 grams to 2 trichinae per gram. A parallel study of garbage-fed hogs carried out during the same period on 1,328 diaphragms revealed 149 (11.21 percent) infected with trichinae when the digestion method was used. Sixty-four (4.81 percent) of the diaphragms were found to be infected when examined by the direct microscopic method alone, and counts by the artificial digestion method were 100 or more parasites per gram of tissue. In 1 case there were 2,741 parasites per gram of tissue.

The greater part of the pork consumed by the people of Louisville is from hogs that have been slaughtered in the local abattoirs. Louisville maintains meat inspection and slaughterhouse ordinances, and no meat is placed on the local market until it has been inspected and

passed by a duly authorized inspector of the United States Government or by an authorized inspector of the Louisville and Jefferson County Health Department. However, the routine inspection does not include an examination for trichina larvae.

To be able to draw a comparison between the incidence of trichinosis in humans and in swine in the Louisville area as shown by this study, it becomes necessary to consider those factors which can account for the difference between 0.2 percent infestation in swine and 20.8 percent infestation in humans. First, it is possible that the high incidence of trichinous infestation in patients in the Louisville General Hospital may not be representative of the population as a whole. A large percentage of these patients are charity cases and their economic and social status tends to be low. Pork, particularly sausage, probably was a common item of the diet since it is usually less expensive than other meat. It is possible that some of these patients consumed large quantities of so-called country sausage. Second, records of these patients with respect to period of residency in the city are incomplete, and it is reasonable to suppose that a large portion of the life of at least some of them was spent in other localities. Third, one infected hog can be the source of disease for a large number of persons, and, by the same token, during a lifetime the average individual consumes meat from an extremely large number of hogs.

Peres (16) in 1942 reported the data from surveys conducted by different investigators almost simultaneously engaged in the study of the incidence of *T. spiralis* in the human and porcine population of the New Orleans area. The incidence in both the human and porcine populations was lower than that found in this study, but Peres likewise found a sharp difference between the incidence of trichinae in the two groups. He used the statistics of Hinman (7) and Sawitz (9) for the incidence of trichinae in man. Studying 2 square inches of diaphragm from each of 200 autopsies, Hinman found an incidence of trichinae of 3.5 percent. Sawitz, using larger samples and examining diaphragms obtained from 400 autopsies, found the incidence to be 6 percent. Peres during 1938 and 1939 examined the diaphragms of 516

southern hogs and the loins of 399 midwestern hogs for the presence of *T. spiralis* in the artificially digested material. None was found infected with trichinae. Likewise, none of 50 samples of sausage from local butchers revealed infection. Pork consumed in the New Orleans area comes from hogs that are raised in the south (Louisiana, Mississippi, and Alabama), hogs that are raised on the outskirts of the city, and those that are raised in the midwest. Those hogs from the outskirts are raised mostly on garbage; those from the other parts of the south are allowed to roam the fields and to feed on peanuts; and those from the midwest are raised largely on grain. About four-fifths of the hogs consumed in the New Orleans area are from the midwest. Certainly, the low incidence agrees with the low infection rate in man in the New Orleans area, as contrasted with other areas of the United States.

### Summary

The direct microscopic examination of 311 human diaphragms from routine autopsies at the Louisville General Hospital, Louisville, Ky., revealed an 11.2 percent incidence of *Trichinella spiralis*. A second series of examinations, using both the direct microscopic method and a modification of the digestion-Baermann methods, detected an incidence of 20.8 percent in the 259 human diaphragms studied. No selection of material was made, except that the diaphragms of all children under 1 year of age were excluded.

No conclusion could be drawn statistically as to the difference in incidence of infestation with *T. spiralis* by race, sex, or age because of the limited number of patients in each category.

The incidence of human infestation with trichinae in Louisville is somewhat higher than that reported by other investigators in studies of human diaphragms taken at autopsy in various other cities in the southern part of the United States. However, there is no statistically significant difference between the incidence of *T. spiralis* reported in this study and that found by Wright in either the human population of the United States as a whole or in that section designated by him as the East

South Central group of States to which Kentucky belongs.

In the examination of 1,000 diaphragms collected from swine slaughtered in Louisville abattoirs, 2 were found infested with trichinae by a modification of the digestion-Baermann method and one of these was also found infested by the direct microscopic method, an incidence of 0.2 percent. Although the exact type of feed is unknown, these swine may be classified as grain fed in conformity with the method used by Hall and others of classifying swine according to the type of feeding most prevalent in the section of the country in which the swine were raised. The incidence reported here is lower than the estimated average of 1.5 percent for the United States, but many other investigators have reported similarly low degrees of infestation.

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#### REFERENCES

- (1) Recommendations of the National Conference on Trichinosis. J. A. M. A. 155: 1395-1397 (1954).
- (2) Nolan, M. O., and Bozicevich, J.: Studies on trichinosis. V. The incidence of trichinosis as indicated by post-mortem examinations of 1,000 diaphragms. Pub. Health Rep. 53: 652-673 (1938).
- (3) Queen, Frank B.: The prevalence of human infection with *Trichinella spiralis*. J. Parasitol. 18: 128 (1931).
- (4) Hood, M., and Olsen, S. W.: Trichinosis in the Chicago area. Am. J. Hyg. 29, Section D: 51-56 (1939).
- (5) Schwartz, B.: Trichinosis—Occurrence, significance and control. Proc. 5th Research Conference of the Council on Research, American Meat Institute, pp. 66-71, March 26 and 27, 1953.
- (6) Hall, M. C., and Collins, B. J.: Studies on trichinosis. I. The incidence of trichinosis as indicated by post-mortem examination of 300 diaphragms. Pub. Health Rep. 52: 468-490 (1937).
- (7) Hinman, E. H.: Trichiniasis in Louisiana. New Orleans M. & S. J. 88: 445-448 (1935-36).
- (8) Sawitz, W.: Are post-mortem statistics on trichinosis valid for the living population? Am. J. Pub. Health 27: 1023-1024 (1937).
- (9) Sawitz, W.: *Trichinella spiralis*. I. Incidence of infection in man, dogs and cats in the New Orleans area as determined in postmortem examinations. Arch. Path. 28: 11-21 (1939).
- (10) Meleney, H. E.: Trichinosis in human diaphragms in Nashville, Tennessee. Am. J. Hyg. 34, Section D: 18-22 (1941).
- (11) Walker, J. H., and Breckenridge, C. G.: Preliminary report on the incidence of trichinosis in Alabama. J. Parasitol. 24: 10, December 1938, supp.
- (12) Wright, W. H., Kerr, K. B., and Jacobs, L.: Studies on trichinosis. XV. Summary of the findings of *Trichinella spiralis* in a random sampling and other samplings of the population of the United States. Pub. Health Rep. 58: 1293-1313 (1943).
- (13) Hall, M. C.: Studies on trichinosis. IV. The role of the garbage-fed hog in the production of human trichinosis. Pub. Health Rep. 52: 873-886 (1937).
- (14) Kerr, K. B.: Certain aspects of trichinosis situation in California (1940) in Meat for millions. Report of the New York State Trichinosis Commission. Ed. 2. (Legislative Document No. 52). Albany, N. Y., Fort Orange Press, 1941, pp. 68-73.
- (15) Cameron, T. W. M.: Investigations on trichinosis in Canada. III. On the incidence of trichinosis in garbage-fed hogs. Canad. J. Res. 18, Section D: 83-85 (1940).
- (16) Peres, C. E.: *Trichinella spiralis*. II. Incidence of infection in hogs and rats in the New Orleans area. J. Parasitol. 28: 223-226 (1942).

PHR

# Neisseria meningitidis Isolated From Case Of Acute Conjunctivitis

By HUGH MILLER, Jr., B.S.

*The identification of the etiological agent in conjunctivitis more often confronts hospital or clinic laboratories than a public health laboratory, but it is a matter of public health interest. The principle involved here applies whenever a Neisseria organism of any kind, not only gonococcus, is suspected. The implication is that reliance on simple microscopic procedure and the acceptance of misleading shortcuts can lead to major error.*

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A CASE of uncomplicated conjunctivitis occurring in April 1953 was found to be due to *Neisseria meningitidis* as the result of bacteriological studies made by the San Benito County Health Department in California.

Smear preparations alone are frequently employed for recognizing the gonococcus from genitourinary tract secretions. Ordinarily, this procedure would present no problem. It entails, however, the risk of ascribing an incorrect etiological agent to the disease process and of

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Mr. Miller, now laboratory director of the Merced County Health Department in California, was a bacteriologist at the San Benito County Health Department, Hollister, Calif., at the time of this report. The clinical information on the case was provided by Roswell L. Hull, M.D. Bacteriological and serologic confirmation of the cultures was made by Jean Johnston of the Oakland (Calif.) Department of Public Health, the division of laboratories of the California State Department of Public Health, and the Communicable Disease Center of the Public Health Service.

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incorrect clinical and epidemiological interpretation, particularly in the case of extragenital infections.

Gram-negative intracellular diplococci were demonstrated on smear preparations of the discharge from acute, purulent conjunctivitis of one day's duration of the right eye in a 4-year-old boy. Cultures were requested prior to treatment and were submitted. The patient responded well to the parenteral administration of 900,000 units of penicillin procaine G followed by 300,000 units per day for 6 days. Symptoms were absent at 48 hours.

The discharge was plated on chocolate agar with the addition of Difco's Bacto supplement A as recommended for 24-hour gonococcus cultures (1). These plates were incubated at 37° C. in a candle jar. Within 24 hours, numerous gray, opaque colonies with an entire edge were present. They were oxidase-positive and showed morphology typical of *Neisseria* by Gram stain. By biochemical test the culture was identified as the meningococcus. Serologically, the organism was placed in group 2.

Since this case was at first considered to be gonorrhea, considerable investigation was made of family and other contacts. Investigative work could be more rationally directed if cases of extragenitourinary *Neisserian* infections were first proved bacteriologically. Bacteriological proof of such infections would avoid also the social, medical, and legal implications usually associated with gonococcal infections in children. It should be noted that Thygeson (2) calls attention to the clinical similarity of inflammation of the eye by the gonococcus and the meningococcus and to the resultant need for bacteriological studies to establish an etiological diagnosis.

## REFERENCES

- (1) Difco manual. Ed. 8. Detroit, Mich., Difco Laboratories, 1948, pp. 87-89.
- (2) Thygeson, P.: Diseases of the conjunctiva. In The eye and its diseases, edited by C. Berens. Ed. 2. Philadelphia, W. B. Saunders and Company, 1949, p. 368.

# Health Education for Palestine Arab Refugees

By THERON H. BUTTERWORTH, Ph.D.

THE UNITED NATIONS Relief and Works Agency for Palestine Refugees (UNRWA) in 1951 requested the assistance of the World Health Organization in evaluating its activities and developing future plans for public health education. The World Health Organization met this request by loaning a health educator to the Agency for 2½ months during the summer of 1952.

The WHO health educator worked with the staff of the UNRWA headquarters office in Beirut and with Agency's country headquarters' staff in Lebanon, Syria, Jordan, and the Gaza strip, formerly under the Palestine mandate, now under Egyptian control. He visited representative field health programs of the Agency in all these countries and held discussions on health problems and health education with staff groups and with the Arab refugees from Palestine.

In most of this work the health educator had the valuable assistance of a refugee who was employed by the Agency and who had received some special training in health education from the Egyptian Government. This assistant had been a camp sanitation officer and a camp leader and was well acquainted with the refugees in the camps and with their problems.

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Clarification of the meaning of health education was a major objective in the consultant's day-by-day meetings with individuals and with various groups. In his survey he found some health education, recognizable as such, to be a part of the UNRWA program. However, the survey also found educationally significant situations, which were neither recognized nor utilized as health education. If health education were to be accepted as an integral part of the Agency's program, it seemed important to try to develop a broader concept of what health education is and what it can do.

It was felt that a written statement, concisely and simply presenting a broader educational approach to health, would be useful to the UNRWA staff, especially to the health, education, and welfare divisions. Such a statement was prepared during the summer of 1952 as a stimulation to continued thought and discussion, as a record of some of the thinking which had taken place in group discussions throughout the camps, and as a guide for future planning.

Believing that this statement, which was prepared for wide distribution among the UNRWA staff, may also be of some general interest to the public health profession, it is presented below with a few editorial changes which seem appropriate in this new setting.

## The Statement on Health Education

Good health education aims to help more people make more free-choice decisions which will result in the maintenance or improvement of their health. The state of health of each

individual is basically the result of his own actions; or, putting it another way, our health is what we make it, to the degree that we are at all able to control our private and social condition. Other than small babies, mental defectives, and those incompetent to assume the normal responsibilities of life, there are few persons who are exceptions to this statement. Each of us inherits certain health strengths and weaknesses, sometimes serious health handicaps. Whether we use our inheritance and the environment in which we find ourselves most effectively for the maintenance and promotion of sound health is largely a matter of personal or group choice.

Society usually provides such health protection services as water purification, sewage disposal, food protection, or quarantine services. And even when these services are provided, their effectiveness is still dependent in large measure on individual and group choice of action. One may choose to drink from the pure water supply or from a supply of questionable potability. Clean safe food provided in a store can become contaminated because of bad health habits in the home. Sewage disposal systems must be used properly to be effective. Quarantine laws protect only to the extent that they are obeyed.

On the other hand, where governments have failed to take the necessary action to protect the health of the citizen, each individual can, through personal choice, and without the aid of government, act to protect his own health and that of his neighbor though his choice of action may be limited by the culture within which he exists. Water can be boiled. Foods can be washed, peeled, cooked, protected by refrigeration, and shielded from dust or insect contamination. Human excreta can be disposed of safely. Ill persons can be avoided and simple isolation practiced. Occasionally, individuals may be forced into situations injurious to their health, but even these situations often represent a group choice, which still leaves opportunities to choose a personal course regarding health.

### *Health Education Defined*

The correct choice of action is most frequently made by those of us whose education regarding health is most complete. By educa-

tion, we mean that aggregate of experience which enables us to live with the highest degree of efficiency, satisfaction, and service in the environment in which we find ourselves. The importance of sound health education is, therefore, obvious.

"Health education is the sum of all experiences which favourably influence habits, attitudes, and knowledge relating to individual, community, and racial health" (1), to quote one definition of health education, and "health," as defined by the Constitution of the World Health Organization, is "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity" (2).

The health education experiences most frequently referred to are (a) the conscious, formalized type of instruction, whether in the school class, university, or community study group, and (b) the exposure to one or more of the usual types of mass media. These kinds of experiences are related to the imparting of information and may or may not educate for action. Too frequently they do not. Individuals may become quite well informed about the ways to establish and maintain health, but until they freely choose to act in accordance with such information they are not really "educated" about health.

Many basic health attitudes and practices are developed without conscious instruction. Care of one's body, eating habits, patterns of sleep, care of the teeth, home remedy practices, actions in the face of oncoming illness, attitudes toward health and disease, choice and use of professional health and medical services—these and many other actions that daily affect health are much more the result of the experience of living in close contact with certain cultural patterns and social customs than of specific information acquired, no matter from what source.

It is true that present actions are dictated by past experience, notwithstanding the fact that one may possess information which indicates an entirely different choice of action.

The Bedonin mother who had had the experience of losing two children because, as she thought, they had got their heads wet, chose not to bathe her third child. She made this decision in spite of the information given her by the nurse as to the great benefit to the child of regu-



lar bathing and the careful explanation that wetting the head had not killed the other two children. The experience of daily visiting the baby center and seeing other mothers wetting their children's heads without harm finally convinced her that she should try it too. Another experience had been added to her life which helped her to make another free choice, that of washing her baby.

The word "favourably" in the definition of health education (1) is important. Some education in respect to health is unfavorable. Too often the unfavorable education is of the experiential type, and its importance is not recognized. A class may learn from the textbook that good ventilation is necessary for the promotion of sound health. Yet, because of a teacher's choice, this same class may sit daily for several years in a hot, poorly ventilated room. The members of the class may develop a liking for such an unhealthy condition despite the instruction in the book.

Or, a woman is urged to come to a maternity home for delivery. Once there, she is given the best medical and nursing care from a technical standpoint and is delivered of a fine baby. But, at the same time there may be so little human kindness and sympathy associated with the professional services that she "learns" that maternity centers are places to be avoided. The experiences of personal neglect and unhappiness will far outweigh the information concerning the usefulness of maternity centers which she may receive at the next antenatal class, if she attends one.

Experiences continually shape patterns of health habits. These experiences, being frequently repeated and usually touching personal lives closely, tend to outweigh the experiences of didactic teaching and information received from various sources. Those of us in public health have only to consider our own actions regarding health to recognize the truth of this statement.

Most of the experiences which educate positively or negatively for health can be controlled. Those of us who are in public health, in whatever particular professional group, need to train ourselves to recognize these experiences and to attach more importance to planning that the experiences be essentially favorable in effect.

In our planning groups we would do well to include, whenever possible, the persons themselves who are to be educated. For it has been said that people usually act upon plans that they have helped to make.

Action is important. To know that vaccination protects against smallpox is to be informed, but to be vaccinated is to be "health educated" with respect to the control of smallpox. Health education, to be effective, must achieve desirable action.

### *Health Education in UNRWA*

In studying health education in UNRWA, we noticed among the professional staff and the refugees themselves a general confusion between health instruction and health education. The aim of health education was most frequently considered to be informing people about health—specific situations which might be called "health instruction." situations in which people were being told what to do—rather than stimulating people to act wisely in regard to their health. The objective was arrived at through the fallacious reasoning that to know is to act.

Health education found throughout the camps was being carried on by many different people in UNRWA. This is as it should be, for health education is, for the most part, an aspect of a program or service rather than a separate entity in itself. It should be carried on by all members of the staff, with the person designated as health educator having the responsibility of stimulating and facilitating the health education aspects of the work of others, as well as of carrying on some direct education.

The program contained many examples of health education and many more opportunities not yet put to use in the interests of health education. Some of the situations found in UNRWA camps more commonly recognized as involving health instruction are these:

Teachers in elementary schools give some health instruction.

Some sanitary inspectors during their daily work give talks to groups of people, explaining the reasons for sanitary regulations.

Health instruction is a part of the literacy training included in the work of one sewing class.





## Positive Education for Health

WHILE as many as 6,000 Palestine Arab refugees are still living under canvas in a refugee camp, most of the camp populations have now been housed in huts of concrete or lumber, which give much better protection against winter storms and hot desert wind. From more than 30,000 tent units in 1950, UNRWA has reduced



the tent housing to approximately 10,000 in 1954. The present number in all UNRWA refugee camps is 340,000. Each camp has a supplementary feeding center, which serves milk and a daily cooked meal to all babies and children recommended by the camp physician. From early pregnancy, mothers are encouraged to attend the antenatal clinics. They learn to make their own baby clothes. They are urged to come to the maternity home for delivery of their child. Once a baby is born, his mother is encouraged to bring him regularly to the infant health clinic. She learns how to bathe her baby. Both mothers and children are having experiences which daily help them to learn the value of good food, carefully prepared and served.



Posters are displayed on the walls of schools, offices, clinics, feeding centers, and similar places.

Some films on health subjects have been shown to school children and to community groups.

Nurses and midwives teach mothers how to wash and dress their babies.

Suggestions for improving health education in UNRWA, made by staff and refugees, included motion picture shows, posters, talks to mothers, additional hours of instruction in schools, use of pamphlets, lectures to young girls, and special classes on health. All of these ways of instructing are important but of little effect if they are not made an integral part of a planned, broad-based education program which includes, in addition, those kinds of personal experiences which influence individuals to action.

The following are a few experiences of those in the camps of UNRWA, which may be having an even deeper effect on the formation of individual health habits but which are not always recognized as having health education significance:

Mothers and children at feeding centers enjoy meals which daily help them to learn the value of good food, carefully prepared and served.

In the feeding centers where young girl volunteers are assisting, good habits are formed with respect to the preparation and care of food.

In some areas it was reported that nurses and midwives were making at least a few visits to their patients' homes, a most effective form of health education.

The experience of being a part of the well-regulated community life of camps and compounds, with available sanitary services, pure water supplies, clinic services, feeding and recreation centers, and reading rooms may be the most important single factor responsible for changing for the better the health habits of the refugees.

The observable good effects of early diagnosis and treatment, of immunization and professional medical care, in reducing or entirely preventing illness, are a potent educational experience.

Hospitalization, when it is a satisfying experience, increases respect for health practices.

In one feeding center, sick mothers and babies, by being placed in isolation, learned to attach importance to the communicability of disease and to the practice of simple isolation.

Profitable and healthy use of leisure time was learned at welfare centers where games are available.

Other examples of health education were found in UNRWA camps, but an extension of the list would serve no useful purpose here. The amount and quality of the health education found were, to a large degree, proportionate to the interest and conviction and capacity of the professional worker responsible. Although there were some who were notable exceptions, many members of the professional field staff of the health division seemed to hold the opinion that medical service—the treatment of disease—was of first importance and that since caseloads and the scarcity of equipment and supplies made it almost impossible to meet demands in this area, it was useless to attempt health education. Health education they considered to be an extra duty, not seeming to understand that through effective health education a crushing caseload might eventually be lightened.

Another attitude which must be considered in these particular health education activities is the refugee's conviction that under present living conditions he can do nothing to protect or improve his health. To the question, how can we help the refugee improve his health? the answer was repeatedly: Supply him with more and better food, a better house, more clothes, and he will take proper care of his health; he knows how but is prevented from doing so because of his living conditions.

Since even the most highly developed and health-educated people still need further health education because they do not always act for their own best interests, it seems improbable that the refugee would become sufficiently health-educated simply by being given clothes, a better home, and better food. In fact, in this part of the world a look at any group which is not composed of refugees refutes the argument. That these people can learn to change health habits for the better has been demonstrated.

Many refugees in only these few years have

changed lifelong habits. Many a desert dweller who had never before used latrines now uses them.

Many a refugee who never gave a thought to his water supply now chooses to use the safe supply provided for him.

Many a mother is washing and dressing her baby in a more satisfactory manner and is submitting her children to immunization, a procedure to which she objected vigorously a few years ago.

People—all kinds of people—can be helped to learn how to make good choices respecting their health. The first step is to help them want to make the change.

### Program Development and Planning

The creation of trained leadership is the first need for the further development of health education on a wider basis among the Palestine refugees. Once there is trained leadership, the priority steps in developing the type of health education defined in the foregoing might take the form of the following suggestions:

1. Assist the UNRWA staff to make use of existing opportunities for health education as these are recognized and help the staff stimulate and create new situations where necessary so that refugees will have more opportunities to acquire positive health habits.

2. Assist in the training of additional leadership in health education of the public.

3. Develop, with the assistance of the Palestine Arab refugees, a broad, planned program of health education which can serve as a foundation for the continuation of health education services wherever the refugees may eventually live.

4. Develop an apprenticeship program whereby the kinds of effective health education now being carried on by some staff members can be learned by others.

5. Assist in obtaining or developing simple health education materials, to be tested for effectiveness before being given wide distribution.

Before a year passed the United Nations Relief and Works Agency for Palestine Refugees had started acting on these suggestions for future planning. The Agency entered into negotiations with the World Health Organization

for specific assistance in developing the health education program. The two organizations signed an agreement in August 1953 whereby, under the United Nations expanded program of technical assistance, the World Health Organization would assign a qualified public health educator to the Agency, would underwrite training fellowships in health education for 10 persons, and would provide a modest sum for teaching equipment and materials.

In November 1953 the World Health Organization assigned a public health educator to UNRWA on a 2-year contract. Through his coordination with members of the UNRWA staff and the staffs of other agencies, a course of instruction in health education was established at the Agency headquarters office in Beirut. The course consists of 6 months of academic work, which is integrated with some field work, and 6 months of full-time supervised field training. Ten Palestine refugees, 7 men and 3 women, were recruited for the training from the areas served by UNRWA and reported on February 22, 1954. The 9 members of the class who completed their academic work in August 1954 and their supervised field work in February 1955 have been employed on a full-time basis by the Agency and are working in the 4 countries in which they did field work.

Thus far the training course has been successful. The Agency requested an increase in fellowship funds, which WHO granted, to assist in the support of a second class of 11 persons who commenced their academic work in November 1954. This group is now on supervised field work in Lebanon, Syria, Jordan, and Gaza. They will complete the year's course in October 1955, at which time it is anticipated they will also be employed by the Agency. It is hoped that eventually they will be utilized as health education leaders by governments and voluntary agencies in the eastern Mediterranean area.

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*A section (pp. 8-14) in the 1955 annual edition of the publication, Health Educators at Work, has been devoted to program planning in health education for the Palestine Arab refugee. Written by Dr. Louis Findlay and William A. Darity, the article tells what came after Mr. Butterworth's article and describes the actual*

training program in health education. Dr. Findlay is the WHO medical officer assigned to UNRWA as chief of the health division, Beirut headquarters office, and Mr. Darity is the WHO health educator on loan to the same office. *Health Educators at Work* is published by the Department of Public Health Education, School of Public Health, University of North Carolina, Chapel Hill, and the Department of

Public Health Education, North Carolina College, Durham.

#### REFERENCES

- (1) American Public Health Association: Report of the Committee, Health Education Section. New York, The Association, 1934.
- (2) Constitution of the World Health Organization. Pub. Health Rep. 61: 1259-1279, Aug. 20, 1946.

## PHS film

### Functioning of Gas Feed Chlorinators

Part 1: Visible Vacuum Chlorinator.

Part 2: Volume Metering Chlorinator.

35 mm. Filmstrips, color graphics, Part 1—12 minutes, 57 frames; Part 2—10 minutes, 42 frames. 1954.

Audience: Sanitary engineers, sanitarians, and others interested in water chlorination.

Available: Loan—Public Health Service, Communicable Disease Center, 50 7th St., NE, Atlanta 23, Ga. Purchase—United World Films, Inc., 1445 Park Avenue, New York 29, N. Y.

The primary parts of visible vacuum and volume metering chlorinators and their functions are illustrated in these filmstrips.

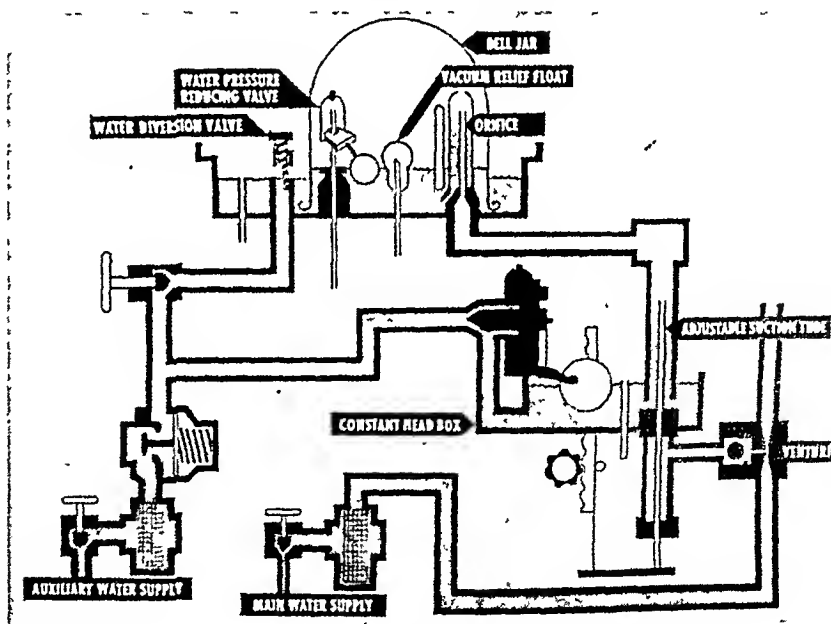
Points to be checked at each inspection for assurance of proper operation of the machines are also depicted. For the visible vacuum chlorinator in part 1, the scale inside

the bell jar that indicates the amount of chlorine being fed, the weight of the chlorine cylinder to tell how near it is to being empty, the chlorine gas, water supply, and auxiliary supply pressure gauges are shown as operation check-points.

For the volume metering chlorinator, part 2, the water pressure gauge,

the pulsations-per-minute, the chart for checking the amount of chlorine fed per day, and the weight of the chlorine cylinder are emphasized.

The basic principles and inspection check-points pictured in these filmstrips aid in the understanding of the functioning of the general types of the machines featured.



A cross section of a visible vacuum chlorinator. Its function is to apply chlorine gas to water in an accurate and continuous flow.

# Education of Public Health Workers

By EDWARD M. COHART, M.D., WILLIAM R. WILLARD, M.D.,  
and FRANCES KORD, M.S.

**H**OW much formal education have public health workers had? How much training in public health have they had? In what fields have public health workers received major education? What further education do they want?

The Yale Public Health Personnel Research Project sought answers to these questions, in keeping with its mission to study people, rather than operations, in public health. Answers were obtained through interviews with 875 professional and semiprofessional public health workers in the State health departments of Colorado, Connecticut, Florida, Maryland, and Michigan, and in selected local health departments and visiting nurse associations in these States and New York. (An account of the methods used was given in the May issue of this journal, pp. 447-452.) These workers were distributed among the various public health services and classified according to position in the administrative hierarchy as shown in table 1.

The agencies chosen for this study were se-

lected, on the basis of the value judgments of the consultants and advisers to the Yale project, as representative of "better-than-average" health departments. Every public health worker whose activities differed materially from those of any of his co-workers was interviewed. As a result, the proportion of high-echelon personnel interviewed was much larger than the proportion of staff-level personnel. This bias may affect conclusions drawn for the combined group of high-echelon and staff personnel and comparisons between them.

## Level of Education

Only 5 percent of the personnel at the higher administrative levels (those of supervisor and higher rank) and 13 percent at staff level had not gone beyond high school (table 2). About 40 percent of the personnel in the statistics service, at both staff and higher administrative levels, as well as 27 percent of the sanitation personnel at staff level and 20 percent of the administration personnel in the high echelons, were in this category.

Thirteen percent of the high-echelon personnel and 32 percent of staff-level personnel had 1 to 4 years of college education but had not received a degree. Whereas 80 percent or more of the high-echelon personnel in most of the services were college graduates, only 40 percent of administration personnel and 47 percent of statistics personnel were in this class. Fifty-five percent of all staff-level personnel were college graduates; the nursing service had the lowest proportion, with 32 percent.

Fifty-three percent of all high-echelon per-

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*Dr. Cohart, associate professor of public health, Yale University School of Medicine, and Dr. Willard, dean of the College of Medicine at Syracuse, State University of New York, were co-directors of the Yale Public Health Personnel Research Project. Miss Kord, director of health education for the Massachusetts Tuberculosis and Health League since 1953, was a research assistant with the Yale project. The project was supported by research grants from the National Institutes of Health, Public Health Service, and the National Tuberculosis Association.*

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**Table 1. Number of personnel interviewed in official agencies and visiting nurse associations, by administrative level and service**

Service	High- echelon <sup>1</sup>	Staff <sup>2</sup>	Total
Medical.....	99	13	112
Nursing.....	118	<sup>3</sup> 142	260
Sanitation.....	69	117	186
Veterinary <sup>4</sup> .....	4	7	11
Laboratory.....	38	87	125
Dental.....	6	6	12
Administration.....	30	3	33
Health education.....	10	20	30
Statistics.....	17	23	40
Nutrition.....	12	1	13
Social work.....	8	6	14
Other professional.....	14	25	39
Total.....	425	450	875

<sup>1</sup> Includes persons with titles of supervisor, consultant, administrative assistant, assistant program director, program director, assistant health officer, and health officer.

<sup>2</sup> Includes persons classified as staff and senior staff.

<sup>3</sup> Includes 1 practical nurse who is counted with "other professional" personnel in subsequent tables and analysis.

<sup>4</sup> Unless otherwise stated, veterinarians are included with sanitation personnel in subsequent tables and analysis.

sonnel held master's or doctor's degrees. Even when the medical service is excluded, the proportion is still slightly higher than 40 percent. Graduate degrees were least common among statistics and administration personnel. Among staff-level personnel, only 22 percent possessed master's or doctor's degrees. Aside from the medical service, the health education service had the highest proportion of personnel with such degrees.

In general, except for the medical service where the doctoral degree is the rule, graduate education was found to be positively associated with position in the administrative hierarchy. Meaningful comparison could be made only in some of the larger services, such as nursing, sanitation, and laboratory.

In the nursing service, 36 percent of the program directors and consultants, as compared with 10 percent of the supervisors and 3 percent of the staff personnel, had graduate degrees. Among sanitation personnel, 53 percent of the program directors, 17 percent of the consultants and supervisors, and 22 percent of the staff workers had graduate degrees. Among the

laboratory personnel, 66 percent of the high-echelon personnel, 41 percent of the senior staff, and 17 percent of the junior staff held graduate degrees. The laboratory service presented a different pattern from the other two services in that the level of education of senior staff personnel differed materially from that of junior staff personnel.

Because of the marked salary differentials among the several services, the relation of salary to level of education was analyzed for each of the larger services separately. In the medical service, no association could be shown between educational level and salary since all members had doctoral degrees, but in the other services analyzed, a positive association was found.

Six percent of the nurses earning less than \$4,000 and 30 percent of those earning \$4,000 or more had graduate degrees; 40 percent of those earning less than \$4,000 and 75 percent of those earning \$4,000 or more were college graduates.

Among sanitation personnel with salaries of \$4,000 or higher, almost half had graduate degrees, whereas only 5 percent of those earning less than \$4,000 a year had achieved this level of education. One-third of the sanitation personnel earning less than \$4,000 and 85 percent of those in the higher salary brackets were college graduates. Half of the engineers and 6 percent of the sanitarians with graduate degrees held positions which paid \$6,000 or more.

More than half of the laboratory personnel in the \$4,000-and-higher salary brackets and only 6 percent of those earning less than \$4,000 held graduate degrees. It was rare for a laboratory worker without at least an undergraduate degree to earn \$4,000 or more. Only 3 percent of the laboratory personnel earning \$4,000 or more were not college graduates. In the salary brackets below \$4,000, 40 percent of the personnel were not college graduates.

### Level of Public Health Training

Public health training was classified into formal and informal. Included in formal training were graduate degrees in public health, baccalaureate majors or minors in public health, and certificates in public health nursing. Planned inservice training (but not orientation as part



of supervision), institutes, short courses, field training, and the study of public health in the basic training of nurses were considered informal public health training.

One-quarter of the high-echelon personnel held graduate degrees in public health; one-fifth had had undergraduate training in the nature of a major or minor in public health or a certificate in public health nursing; and one-third had received informal public health training only (table 3). More than half of the high-echelon medical personnel and an even higher proportion of the high-echelon nurses had had formal public health training, but most of the nurses had received their training at the undergraduate level. Undergraduate public health training of personnel other than nurses was negligible.

Only 7 percent of the staff personnel held graduate degrees in public health, and only 14 percent had had formal public health training at the undergraduate level. Among staff per-

sonnel, as among high-echelon personnel, undergraduate training in public health was restricted almost entirely to nurses. A trend toward the more widespread inclusion of instruction in public health in the basic training of nurses is indicated by the fact that 65 percent of the nurses who had received their training since 1930 had had such instruction, as compared to 45 percent prior to that date.

Approximately half of the staff-level personnel in the medical, nursing, and health education services had received formal public health training, as compared with 4 to 12 percent of the personnel in the other professional services.

In view of the high educational level of many members of the laboratory service, but the relative paucity of public health training, the areas of graduate study of laboratory personnel were investigated. This information was available for 36 laboratory personnel: 86 percent had specialized in the natural sciences; 14 percent, in public health; 8 percent, in medicine; 5 percent,

Table 2. Level of education of personnel in State and local health departments <sup>1</sup>

Administrative level and service	Number of personnel	Percent with—				
		High school diploma or less	1-4 years' undergraduate education	Bachelor's degree	Master's degree	Doctor's degree
<i>High-echelon</i>						
Medical.....	99	0	0	0	0	100
Nursing.....	118	0	22	52	24	1
Sanitation.....	73	7	14	36	37	7
Laboratory.....	38	0	8	26	32	34
Statistics.....	17	41	12	29	6	12
Nutrition.....	12	0	0	25	75	0
Administration.....	30	20	40	30	10	0
Other professional.....	38	8	8	21	47	16
Total.....	425	5	13	29	23	30
<i>Staff</i>						
Medical.....	13	0	0	0	0	100
Nursing.....	141	0	68	29	3	0
Sanitation.....	124	27	18	31	17	6
Laboratory.....	87	11	8	57	18	5
Statistics.....	23	43	9	22	22	4
Health education.....	20	0	20	25	55	0
Other professional.....	<sup>2</sup> 41	10	36	17	24	14
Total <sup>3</sup> .....	449	13	32	33	15	7

<sup>1</sup> Includes visiting nurse associations.

<sup>2</sup> Information on level of education was not obtained from one staff worker.

<sup>3</sup> Total percentages are approximations only, because the staff-level interview sample was not equally representative of all services.



Table 3. Level of public health training of personnel in State and local health departments <sup>1</sup>

Administrative level and service	Number supplying informa- tion	Percent with—				
		No training	Informal training only	Formal training		
				Under- graduate education <sup>2</sup>	Graduate degree, nonaccred- ited	Graduate degree, accredited <sup>3</sup>
<i>High-echelon</i>						
Medical.....	67	25	18	1	3	52
Nursing.....	85	0	22	66	5	7
Sanitation.....	41	20	60	0	3	17
Laboratory.....	28	28	65	0	0	7
Statistics.....	10	40	50	0	0	10
Nutrition.....	12	17	42	0	25	17
Administration.....	15	87	7	0	0	7
Other professional.....	35	28	37	6	2	26
Total.....	293	21	33	20	4	22
<i>Staff</i>						
Medical.....	12	17	25	0	0	58
Nursing.....	92	4	51	44	0	0
Sanitation.....	71	25	62	8	3	1
Laboratory.....	85	50	46	0	0	4
Statistics.....	21	43	52	0	0	5
Health education.....	14	43	0	0	7	50
Other professional.....	34	44	47	3	0	6
Total <sup>4</sup> .....	329	29	49	14	1	6

<sup>1</sup> Includes visiting nurse associations.<sup>2</sup> Baccalaureate major or minor or certificate in public health nursing.<sup>3</sup> Schools accredited by the American Public Health Association for degrees in public health.<sup>4</sup> Total percentages are approximations only, because the staff-level interview sample was not equally representative of all services.

in engineering; and 3 percent, in veterinary medicine.

All the graduates of accredited schools of public health were given the opportunity to discuss the training which they had received, and 80 of them offered comments. It is important to point out some of the characteristics of this group before considering the replies. Approximately half had received their public health degrees since 1945, and only 15 percent, prior to 1935. Professionally, the group was constituted as follows: physicians, 52 percent; health educators, 11 percent; nurses, 9 percent; engineers and laboratory scientists, each 6 percent; dentists, 5 percent; sanitarians, 4 percent; statistics and nutrition personnel, each 2 percent; and administrators, 1 percent.

The most frequent criticism of the public health curriculum was to the effect that not enough instruction was given in the practical

aspects of community organization and public relations. This was closely followed in frequency by statements about the lack of adequate courses in administration. Through many of the comments ran the complaint, either implied or clearly stated, that the graduate curriculum in public health was not practical enough, that it should place much more emphasis on field work, and that perhaps many of the teachers might benefit from current, or at least more recent, practical experience in the field.

Table 3 reveals that one-third of all high-echelon personnel had had only informal public health training. An additional one-third had received such training as well as formal public health training. As can be seen in table 4, informal training was most frequent among nursing personnel and practically nonexistent for administration personnel.

An analysis of the type of informal training

received reveals that, in every service, there was greater participation in short courses or institutes than in any other category of informal public health training. Of all high-echelon personnel, 53 percent had participated in short courses or institutes and 34 percent in field training in other agencies. The extent of participation in field training in other agencies by nurses was at least twice that of any of the other services. Inservice training was the least frequent of the three components of informal public health training.

Two-thirds of the workers at staff level also had received informal public health training, either alone or in combination with formal education in public health. Forty percent had had short courses or institutes; 24 percent had had field training in another agency; and 22 percent had had inservice training.

Staff nurses, like high-echelon nurses, had participated in informal public health training to a greater extent than members of any of the other services. About 90 percent of the nurses

had had some kind of informal training in public health, and 72 percent had participated in short courses or institutes.

### Content of Education

The content of major education, that is, "minors" or "majors" at the undergraduate or graduate level, was classified according to nine broad categories as follows: mathematics and the natural sciences, medicine, fields allied to medicine, engineering, public health, social sciences, administration, the humanities, and others. The distribution of public health workers according to this system of classification of major education is given in table 5.

The public health workers in this study can be divided into two groups in accordance with the proportions who had had major education in the natural sciences. In one group are the medical, sanitarian, and laboratory scientist personnel, at least two-thirds of whom have had major education in the natural sciences. The

**Table 4. Types of informal public health training of personnel in State and local health departments <sup>1</sup>**

Administrative level and service	Number supplying informa- tion	Percent with—			
		Any in- formal training	Inservice training	Short courses	Field training in other agencies
<i>High-echelon</i>					
Medical.....	67	58	9	39	30
Nursing.....	85	95	16	73	64
Sanitation.....	41	80	22	49	19
Laboratory.....	28	71	25	46	25
Statistics.....	10	50	20	40	0
Nutrition.....	12	75	42	58	33
Administration.....	15	7	0	7	0
Other professional.....	32	53	18	68	16
Total.....	290	71	17	53	34
<i>Staff</i>					
Medical.....	12	66	25	58	50
Nursing.....	92	90	17	72	47
Sanitation.....	71	69	39	42	20
Laboratory.....	85	54	15	10	5
Statistics.....	21	57	24	48	4
Health education.....	14	50	7	28	36
Other professional.....	35	60	20	22	11
Total <sup>2</sup> .....	330	68	22	40	24

<sup>1</sup> Includes visiting nurse associations.

<sup>2</sup> Total percentages are approximations only, because the staff-level interview sample was not equally representative of all services.

Table 5. Content of major education of public health personnel

Category of personnel	Number supplying information	Percent with major education in—								
		Mathematics or the natural sciences	Medicine	Fields allied to medicine	Engineering	Public health	Social sciences	Administration	Humanities	Other
Medical.....	79	68	100	0	0	58	2	0	9	5
Nursing.....	177	2	3	100	0	61	3	0	9	7
Engineer.....	42	5	0	0	100	14	0	2	0	5
Sanitarian <sup>1</sup> .....	30	70	0	3	3	23	7	3	10	17
Sanitary inspector.....	30	10	0	3	0	3	3	0	3	10
Laboratory scientist <sup>1</sup> .....	93	91	8	6	6	4	1	0	8	8
Laboratory technician.....	20	30	0	0	0	0	0	0	0	20
Statistics.....	31	16	0	0	3	10	26	10	6	16
Health education.....	22	36	0	4	0	45	14	0	32	32
Nutrition.....	13	0	0	77	0	46	0	8	0	62
Administration.....	18	6	0	0	6	6	6	28	11	28
Other professional.....	59	19	7	47	3	17	12	10	17	20

<sup>1</sup> College or professional school graduate.

second group embraces all the remaining categories of personnel, only one-third or less of whom have had such education.

Medical education was limited almost entirely to the medical service. All the nurses and a large percentage of the nutritionists, of course, had had major education in allied medical fields. Except for an occasional person with engineering training in the administration, statistics, and laboratory services, engineers were limited to the sanitation service.

More than half of the medical and nursing personnel had had formal public health training. They ranked highest in this respect, whereas sanitation, laboratory, statistics, and administration personnel were at the bottom of a rank-order listing.

With the exception of 14 percent of the personnel in the health education service and 26 percent of those in the statistics service, less than 10 percent of the personnel had had major education in the social sciences. The social science education of the statistics personnel was primarily in the field of economics.

Less than one-third of the administration personnel had had major education in administration. None of the physicians, nurses, laboratory personnel, or sanitary inspectors and only 2 to 3 percent of the sanitarians and engineers had had major education in general administration.

One-third or less of the several categories of public health personnel had had major education in the humanities; health education personnel had the highest percentage with major education in these fields.

Because of the prevailing interest in the baccalaureate majors of medical personnel who enter upon careers in public health, this subject was investigated. Eighty-two percent of the physicians had majored in the natural sciences, and 9 percent, in the humanities. The remaining 9 percent were spread among several different fields, with only 1 percent in the social sciences. It is evident, therefore, that education in social sciences could not have been a major factor in directing the paths of these individuals into public health.

Another area in which there has been considerable interest is the baccalaureate majors of health education personnel. The findings in this study corroborate the general impression that health education personnel have diverse educational backgrounds. One-third had majored in the humanities; another third, in the natural sciences; and only 11 percent, in the social sciences. In the group of health educators with graduate degrees from accredited schools of public health, almost half had majored in the natural sciences, but none had majored in the social sciences.

## Desire for Additional Education

Approximately 70 percent of 608 professional public health workers (in Connecticut, Maryland, Michigan, and New York) desired additional education (table 6). Differences between State and local personnel were not significant, and the desire for further education was not related to position in the administrative hierarchy. Fewer medical than nursing, sanitation, or laboratory personnel wanted additional education.

Sixty-eight percent of the workers desiring further education wanted individual courses not leading to a degree; 1 percent wanted a baccalaureate degree in engineering; and between 6 and 10 percent desired each of the following types of education: inservice training, institutes, a baccalaureate degree in a field other than engineering, a graduate degree in public health, and other graduate degrees. A significantly higher proportion of high-echelon nurses

(20 percent) than of other high-echelon personnel (4 percent) desired a graduate degree from a school other than an accredited school of public health, and a significantly higher percentage of the staff nurses (30 percent) than of other staff personnel (4 percent) desired a baccalaureate degree.

As a further index of the emphasis placed upon education by different categories of public health personnel, the data were analyzed to determine how many of those without degrees desired them. The numbers without college degrees in the higher levels of the administrative hierarchy were too small for meaningful comparison by service. At the staff-level, 31 percent of the nurses, 23 percent of the laboratory personnel, and 10 percent of the sanitation workers not holding degrees desired them. A significantly higher proportion of nurses than of all other personnel combined desired a baccalaureate degree.

Table 6. Content of education desired by personnel of State and local health departments <sup>1</sup>

Administrative level and service	Number supplying informa- tion	Percent desiring further education	Percent desiring education in—			
			Public health	Mathe- matics or the natural sciences	Social studies <sup>2</sup>	Human- ities
<i>High-echelon</i>						
Medical.....	66	56	39	11	23	0
Nursing.....	84	82	53	5	25	11
Sanitation.....	40	80	57	25	28	0
Laboratory.....	28	68	21	42	4	4
Statistics.....	10	70	30	30	20	0
Nutrition.....	12	92	67	8	33	8
Administration.....	15	60	27	7	33	0
Other professional.....	30	67	43	10	27	3
Total.....	285	72	45	14	24	4
<i>Staff</i>						
Medical.....	12	50	33	8	8	0
Nursing.....	89	79	66	0	16	6
Sanitation.....	69	71	57	17	21	0
Laboratory.....	84	70	20	54	6	0
Statistics.....	21	52	14	29	9	5
Health education.....	12	58	0	0	58	0
Other professional.....	36	58	33	3	25	6
Total <sup>3</sup> .....	323	69	42	20	16	2

<sup>1</sup> In Connecticut, Maryland, Michigan, and New York.

<sup>2</sup> Includes the social sciences, the science of human behavior, administration, community organization, and the arts and techniques of communication.

<sup>3</sup> Total percentages are approximations only, because the staff-level interview sample was not equally representative of all services.

Education desired was divided into four broad categories: public health, mathematics and the natural sciences, social studies, and the humanities. Social studies included the social sciences, the science of human behavior, administration, community organization, and the arts and techniques of communication. The preferences of the members of the several services in accordance with administrative level are to be found in table 6.

Of all the public health personnel interviewed, approximately one-half desired further education in public health; one-fifth, in social studies; one-sixth, in mathematics and the natural sciences; and only a small fraction, in the humanities. A significantly larger proportion of the high-echelon personnel (24 percent) than of the staff personnel (16 percent) desired further education in social studies.

There were a number of significant differences among the services. Fewer laboratory personnel than any other category, except statistics and health education personnel at staff level, desired further education in public health. A much larger percentage of laboratory personnel than of personnel in any other service were interested in further education in the natural sciences, and, correspondingly, a much smaller percentage of laboratory personnel wanted further education in social studies.

A more detailed examination of the desire for further education in public health revealed that the greatest demand among high-echelon personnel was for general public health education. Fifteen percent indicated this preference. Five percent wanted education in environmental sanitation; 5 percent, in medicine; and 3 percent, in engineering. Two percent or less expressed the desire for education in adult health, communicable disease, health education, laboratory science, maternal and child health, medical care, mental health, nursing, or rehabilitation.

Among staff-level personnel, 11 percent desired education in nursing; 9 percent, in environmental sanitation; and 4 percent, in engineering. Seven percent of the staff workers were interested in general public health education. Two percent or less expressed a preference for education dealing with any of the other aspects of public health.

## Areas for Evaluation

Although the purpose of the research reported here was simply to determine the facts, it would seem appropriate to point out a few of the areas in which the factual data call for evaluation.

There was a wide range in educational level. Approximately one-tenth of the professional and semiprofessional personnel had not gone beyond high school. Another one-quarter had not received a college degree. Nurses are in an unusual position in this respect, inasmuch as most nurses obtain their training in hospital schools of nursing, which do not grant degrees.

Do these findings indicate that a sizable proportion of the workers have not reached an educational level sufficient to qualify them for their jobs? If the answer to this question is in the affirmative, what are the factors responsible for this state of affairs and how can they be altered?

Or are there forces operating within the domain of public health which place unwarranted emphasis on educational level and therefore lead to the pursuit of academic degrees which do not necessarily contribute to the successful fulfillment of public health job responsibilities? Why, for example, do public health nurses feel a strong need to obtain a baccalaureate degree? Is it because they feel the need for more education in the liberal arts, the social sciences, or the techniques of nursing? Or is it because the possession of a college degree, regardless of area of study, is necessary for advancement?

Undergraduate training in public health was relatively frequent among the nurses and practically nonexistent among the other categories of personnel. Are opportunities for undergraduate education in public health being missed? Or should education in public health be reserved for the graduate level?

Laboratory personnel differ from most other health department personnel in that their interests appear to be restricted to the laboratory and do not encompass the broad field of public health practice. What effect does this have on the "team approach?" For that matter, what is the effect of marked variation in educational level and background upon communication, administration, and a cooperative effort? Does

the common understanding essential for teamwork exist?

A positive correlation was shown to exist between formal education and position in the administrative hierarchy and between education and salary, but exceptions were sufficiently frequent to give one pause. Are these exceptions examples of poor public health practice? Or is formal education perhaps less important than public health workers are in the habit of believing?

It was reported in a previous article that about one-third of the time of health workers was devoted to activities related to administration and community organization. How have public health workers been qualified by education to perform these tasks? Major education in administration was rare indeed, except among personnel in the administration service, and even there it was found among a minority only. Major education in the social sciences, although not as rare as that in administration, was limited to less than 1 in 10 workers. Emphasis was on the natural sciences. Is this adequate preparation for public health practice? Perhaps we have placed too much emphasis on level of education and given insufficient consideration to content.

The importance and value of public health training need reexamination in the light of several of the findings of this study. Between one-fifth and one-third of the public health workers had had neither formal nor informal public health training, and another third had had informal training only. Formal public health training was more frequent among high-echelon than among staff-level personnel and very much more frequent among the physicians, nurses, and health educators than among other personnel. How do these facts influence public health practice? And, conversely, what is the effect of public health practice on public health training?

Only a relatively small proportion of the personnel desired inservice training. An investigation into the reasons for this attitude might be revealing. It is not unlikely that the nature

and caliber of inservice training programs were important determinants of this attitude and that the proper organization of inservice training presents a major opportunity for the education of public health workers. Where does responsibility for such organization rest?

What is the role of the schools of public health in the education of public health workers? It appears that the schools of public health play a major role in the education of medical personnel only. More than 50 percent of the public health physicians and health education personnel had received graduate education in public health, but only about 10 percent of the members of the other services had had such education, many of them in schools other than the accredited schools of public health. Furthermore, informal public health education in the form of short courses and institutes was the greatest single source of public health training for the latter workers and also the type of training desired by the largest number. Schools of public health play a very minor role in sponsoring and giving such courses.

The most frequent criticism of the curriculum of schools of public health was related to the teaching of administration and community organization. A common complaint was that this training was not only insufficient in amount, but also inadequate in scope, because of the failure to include practical applications of principles, in line with the needs of practitioners of public health.

The problem raised by this criticism is part of a broader question which relates to the role of institutions of higher learning generally. Is it the responsibility of such institutions to train investigators and research workers who will enlarge the boundaries of knowledge? Or is it their responsibility to train practitioners to apply present knowledge effectively to the problems of our society? Or is it perhaps both of these? If the responsibility does, in fact, encompass the training of both researcher and practitioner, then it appears that it is not being discharged adequately by our schools of public health.

# *Morbidity and Mortality in Early Infancy*

Infant mortality in the United States, as evidenced by records available since the organization of the birth registration area in 1915, has declined rather steadily. The rates in the Mountain and Southern States are somewhat higher than in the three other broad regions—the Northeast, North Central, and Pacific sections.

Trends of infant mortality of males and females are parallel but the rates for females are considerably lower than those for males. Considering actual rates by age of the infant, the older the infant the more rapid the percentage decline in infant death rates.

Reduction of rates to a comparable annual basis indicates extremely high mortality from all causes at the ages under 1 day and 1-2 days, with an uninterrupted decline with age in the rates for the 12 months of the first year of life.

Among infants of all ages under 1 year, the most frequent causes of illness are respiratory, digestive, communicable, and congenital malformations and diseases of early infancy. In contrast, the most frequent causes of death are immaturity, both with and without various diseases of early infancy, and congenital malformations. Pneumonia also stands high as a cause of infant mortality.

In five broad diagnosis groups for illness and mortality, infant illness rates for females are generally below those for males, and infant mortality rates for females are almost uniformly lower than for males.

Considering an immature infant as one weighing 2,500 gm. or less at birth, and a mature infant as one weighing 2,501 gm. or more at birth, the neonatal infant mortality from all causes and from specific causes among the mature as compared with the immature was extremely small. However, neonatal mortality among infants weighing 4,501 gm. or more at birth was somewhat higher than at the minimum, which occurred among infants weighing 3,501-4,000 gm.

Whooping cough, measles, and chickenpox had relatively high incidence rates during the first year of life, and mumps and german measles, rather low rates in that period. Whooping cough and chickenpox had relatively high secondary attack rates but measles, german measles, and mumps had relatively low such rates.



*Public Health*

**MONOGRAPH**

**No. 31**

The accompanying summary covers the principal findings presented in Public Health Monograph No. 31, published concurrently with this issue of Public Health Reports. The authors are with the Division of Public Health Methods, Public Health Service.

Readers wishing the data in full may purchase copies of the monograph from the Superintendent of Documents, Government Printing Office, Washington 25, D. C. A limited number of free copies are available to official agencies and others directly concerned on specific request to the Public Inquiries Branch of the Public Health Service. Copies will be found also in the libraries of professional schools and of the major universities and in selected public libraries.

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Collins, Selwyn D., Trantham, Katharine S., and Lehmann, Josephine L.: Illness and mortality among infants in the first year of life. Public Health Monograph No. 31 (Public Health Service Publication No. 449). 20 pages. Illustrated. U. S. Government Printing Office, Washington, D. C., 1955. Price 15 cents.

# Cancer Control Activities of the National Cancer Institute

By RAYMOND F. KAISER, M.D.

CANCER CONTROL is concerned with the actual prevention of cancer whenever possible, with the discovery of the disease in its earliest stage, and with the provision of adequate services and facilities for diagnosis and treatment. Ideally, a cancer control program to be effective requires:

1. An alert and trained profession.
2. An informed public.
3. Suitable methods for prevention of the disease.
4. Case finding, screening, or diagnostic procedures which can be applied on a mass basis to sort out individuals with the disease from the remainder of the population.
5. Adequate services and facilities for diagnosis and treatment.

The cancer control program of the National Cancer Institute of the Public Health Service is designed to meet some of the needs which exist in these requirements and to demonstrate appropriate methods for fulfilling some of these conditions. This program, now in its eighth

year, has special implications for practicing physicians.

Cancer diagnosis and treatment frequently call for the services not of a single physician but of a qualified team. However, the cancer patient ordinarily is seen first by a general practitioner, whose diagnostic training and experience often determines the outcome. For this reason, the major emphasis in cancer control is placed on programs designed to aid the physician by improving professional undergraduate, graduate, and postgraduate education and by providing diagnostic and other special services to help the physician be effective.

If the physician is to manage successfully an optimal number of cancer cases, he must bring to his practice an awareness of cancer in all of its diverse manifestations. Obviously, the place to inculcate such an awareness is in the undergraduate school. However, it can be fairly said that until a few years ago most medical school curriculums did not provide an effective and integrated presentation of this important subject.

On the basis of a study of cancer teaching in medical schools made early in 1946, our National Advisory Cancer Council recommended that the National Cancer Institute undertake a program of financial assistance to medical schools to coordinate and improve the teaching of cancer to undergraduates, thereby increasing

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*Dr. Kaiser is chief of the Field Investigations and Demonstrations Branch of the National Cancer Institute, Public Health Service. He presented this paper before the Maryland Medical and Chirurgical Faculty April 28, 1954.*

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the students' awareness of cancer. The program, based on these recommendations, has gained universal acceptance during the 7 years of its operation, and today all approved medical schools are participating in the program.

Each of the 4-year medical schools receives a grant up to \$25,000 annually, and each 2-year medical school receives a grant up to \$5,000 a year for the broad purpose of correlating and improving its cancer instruction. Within this general purpose the schools have been permitted maximum latitude to develop the type of program which best meets their particular circumstances. We have always felt that the direction of teaching programs must not come from the outside, but must be intramural and autonomous. Our belief has been justified not only by the widespread acceptance of this program, but by the perceptible improvement in cancer teaching.

A parallel program through which grants up to \$5,000 annually are made to dental schools for instruction of undergraduate students in the recognition of oral cancer has been in existence for approximately the same period of time. This program is based on the fact that a large proportion of oral cancer cases are first seen by dentists, and only a limited percentage of these are recognized as malignant conditions requiring immediate referral to adequate medical attention. This program, too, has enjoyed widespread acceptance, and practically all approved dental schools are participating.

In recent years considerable effort has been devoted to the improvement of cancer instruction in a limited number of schools of nursing in order to determine the most practical methods of providing graduates with a better understanding of cancer and to equip them better for handling cancer nursing activities.

For a number of years similar educational grants have been extended to a small number of schools of public health in order to provide instruction for health department personnel in the public health aspects of the cancer problem.

With the increase in the magnitude of the cancer problem, there has developed a need for physicians with special training in the diagnosis and treatment of cancer. Both voluntary and governmental groups provide support for specialized training of graduate physicians.

The institute's program enables young graduate physicians interested in cancer to undertake clinical training in specialized fields related to its diagnosis and treatment. In recent years there has been a sharp increase in the number of physicians receiving such training in the three major disciplines of surgery, radiology, and pathology. At present, 143 graduate physicians are being supported in such training throughout the country.

For the practicing physicians, a number of attempts have been made to bring recent information about the disease directly to them. One of the most important of these has been the production, jointly by the institute and the American Cancer Society, of a series of films for professional audiences depicting the early diagnosis of cancer. In this series individual films have dealt with the diagnosis of breast, gastrointestinal, uterine, oral cancer, and lung cancer.

These films have been made available to practitioners through medical societies, medical schools, State health departments, and State divisions and county units of the American Cancer Society.

Other attempts at professional education have been handled through support of national cancer conferences, cancer symposiums, professional bulletins, cancer manuals or guidebooks, and refresher courses. These attempts at professional education have met with varying degrees of success; however, it is an essential part of the cancer problem and is considered a field requiring continuous efforts.

### **An Informed Public**

The history of public understanding of the cancer problem in America has been one of gradual gain in the past century, with a marked increase in public interest and awareness of cancer in recent years. It is conceded by most authorities that a large and continuous education program, based on accurate data and using currently available knowledge, will result in considerable control of mortality from many types of cancer. To be successful, a public education program must stimulate the individual's awareness of cancer and motivate him to seek medical attention at the earliest possible moment in the development of cancer.

To develop an informed public, the institute has created educational materials which complement those of voluntary groups. And it has produced, in conjunction with the American Cancer Society, public information materials. Notable among these has been the film entitled "Breast Self-examination" which presents to women basic facts about breast cancer and urges them to seek their physician's advice at an early date. Another recently released film, "The Warning Shadow," was produced under the same sponsorship and is directed toward men over 45 years of age, urging them to seek semi-annual chest X-rays from their physicians.

In addition to assistance in production, the institute has developed arrangements with the American Cancer Society for the use of such information materials in a manner which would stimulate the individual's awareness of cancer and motivate the early seeking of medical care.

In general, the public is better informed about cancer today than at any time in history. However, even with progress in research and therapy, the education problem will continue and, in fact, may increase.

### **Cancer Prevention**

In the field of cancer prevention, knowledge has been meager largely because in the past cancer workers have given little attention to environmental factors which may have a relationship to the causation of human cancer. Much of the knowledge now available has resulted from studies on small groups of people utilizing statistical, genetic, epidemiological, and other techniques to uncover relationships between cancer and environmental factors. For example, the first known etiological agent for scrotal cancer was confined to a small occupational group, the chimney sweeps of London.

Since the inception of the cancer control program, the potentials lying in the field of environmental cancer have been recognized. It was felt that, if relationships could be established between the development of cancer and certain specific materials the individual encounters in his home or industrial environment, it would be possible to eliminate or reduce the exposure to such carcinogenic materials, thereby preventing the development of certain cancers.

Numerous studies and investigations that have an immediate bearing on environmental factors have been undertaken by the National Cancer Institute or have been supported through grants. These studies have shown that most persons, if not all, have some degree of exposure to carcinogenic environmental agents under modern living conditions. They have also shown, however, that there is a latent period before specific cancers appear and that this is related to the degree and duration of exposure to a carcinogenic agent.

While there is much disagreement regarding the exact nature and the role of some of these so-called environmental carcinogenic factors—the current controversy concerning the relationship of cigarette smoking and lung cancer, for one—there has been accumulating in recent years much evidence that cannot be overlooked in respect to cancer control activities.

Among the environmental factors that have been shown to be carcinogenic are (a) certain products and byproducts of the manufacture or processing of aniline dyes, coal tars, and petroleum, (b) arsenicals and some inorganic chemicals, and (c) radioactive substances, X-radiation, and ultraviolet radiation. As more is learned about these and other suspected carcinogenic agents it is feasible to consider the establishment of cancer prevention programs in locations where such hazards exist, incorporating safe production and handling methods for the hazardous materials and instituting periodic examination of the exposed workers.

This is an aspect of the cancer problem which has come under systematic study only recently and in which increased efforts offer unlimited possibilities for making significant contributions to the solution of the cancer problem.

### **Diagnostic Tests and Case Finding**

The key to cancer control today is early diagnosis and treatment, but this statement points up one of our biggest problems—how to find the cancer case early enough. It is recognized that there is no method available today other than general periodic physical examinations which holds promise of discovering early cancer of all types in the population. Periodic examinations do provide the opportunity for discover-

ing a sizable number of early lesions since more than one-half of all cancers occur at sites accessible to direct examination. However, this method is expensive and time consuming; and even if all persons of so-called cancer age could be persuaded to seek periodic examination, there are simply not enough trained hands in the country to do the job. Urgently needed, therefore, is a test which can be applied on a mass basis at reasonable cost and with specificity sufficient enough to identify a high percentage of cancer cases in an early stage.

For a great many years laboratory investigators, as well as practicing physicians, have been looking for differences between persons with early cancer and cancer-free individuals—subtle differences in the blood, sputum, urine, and various body chemicals. The belief that these differences are specific and measurable forms the basis for many reported so-called diagnostic tests. There have been numerous attempts to develop diagnostic and screening tests, and more recently, the entire subject has aroused great public and professional interest. The demand for a diagnostic test has become so great that every new procedure proposed is in danger of premature exploitation before its clinical validity can be determined. Recognizing this situation, the institute, through its Field Investigations and Demonstrations Branch, established a cooperative program with investigators in a number of medical schools. Evaluation of reported cancer tests is carried out under controlled conditions. At the same time, other investigators are encouraged, through grants, to pursue new leads which show promise for the development of a diagnostic or screening test.

Although a general diagnostic test for cancer is not available, some developments in recent years in diagnostic tools may form the basis for a screening test for cancer of specific sites. One of these, the cytological method developed by Papanicolaou and Traut for the discovery of early cervical cancer, has been evaluated and promoted as a diagnostic aid. Its usefulness as a screening procedure for uterine cancer is currently being evaluated by the institute in a study being conducted in Memphis and Shelby County, Tenn., in cooperation with the Univer-

sity of Tennessee Medical School and the county health department. The original cytological technique has been modified for use in the discovery of cancers of other sites, namely, lung, prostate, gastric, and bladder cancer. However, its usefulness and feasibility in these types of cancer have not yet been fully evaluated either as a diagnostic or screening procedure.

A recent promising development in this field is the test for prostatic cancer, developed by Fishman and later modified by Cline. Both of these developments were supported through the institute's control program. Here again further evaluation is necessary and is being carried out by the institute.

Even more recently Penn and Dowdy, with partial support from the control program, have developed a simple blood test which shows some promise of being able to distinguish between people free of cancer and those who may have it. Much more work and evaluation must be carried out on this procedure before it can be declared acceptable.

It might be appropriate at this time to clarify the type of test in which cancer control workers are most interested. Primarily, it is a test which will separate a large group of examinees into two categories—one consisting of those whose reaction to the test is negative, and the other consisting of a relatively smaller number of persons whose reactions are positive and who are, therefore, cancer suspects. It should be a test which would pick up a high percentage of individuals with early localized cancer. It should have a high degree of specificity without a large percentage of either false negative or false positive results. If an acceptable test which meets these general criteria can be developed, it would be a significant forward step in cancer. While such a test would not eliminate the need for further diagnostic procedures to diagnose the case, it would make it possible to concentrate diagnostic efforts on the small group of individuals with positive test results. Despite the many problems associated with the development of an acceptable mass screening test, results to date have been encouraging. It seems entirely possible that a test or battery of tests can be developed which will be effective on a mass screening basis in sorting out cancerous and noncancerous individuals.

In this connection, a small beginning has been made to conduct and support statistical epidemiological studies which might reflect geographic, climatic, racial, socioeconomic, and environmental differences in the occurrence of cancer. Preliminary data from some of these studies suggests that it may be possible to sort out the kinds and types of people who would be most likely to develop cancer. If such determinations could be substantiated, case-finding efforts could be directed more appropriately toward groups with the promise of the greatest cancer yield.

### **Cancer Facilities and Services**

One of the most practical activities which has contributed to the control of cancer to date has been the organization and operation of cancer clinics. These clinics, usually operated in a general hospital, provide an environment in which representatives of the various specialty groups concerned with cancer, such as surgery, pathology, and radiology, can work with the patient's physician in arriving at an accurate diagnosis and effective treatment. The number of cancer clinics in the Nation has increased markedly in recent years. However, there are still not enough to meet the need, and the establishment of additional cancer clinics is being promoted and encouraged. This, along with various other types of services for physicians, has been encouraged through the institute's

program of grants to State health agencies for cancer control activities.

Under this program each State receives an annual allotment based on a formula which takes into account cancer mortality, financial need, extent of the problem, and population density. The grants must be matched on a two-for-one basis. These funds may be used for a variety of purposes which aid physicians as well as the cancer patient. Included among these are support for cancer clinics, cytology services, tissue services, cancer registers, statistical research, professional and lay education, nursing services, limited hospitalization for diagnostic purposes, tumor registers, environmental cancer programs, and tissue slide loan registers. All of the official State agencies now have cancer control programs incorporating a few or several of these features.

### **Conclusion**

An extensive, dynamic cancer control program is under way in this country. It has resulted from the combined efforts of many professional groups, private, voluntary, and governmental, as well as from the efforts of medical specialists, clinicians, private practitioners, public health workers, and scientists. There is a continuing need to improve the nature and effectiveness of the program. The latter will improve as cancer research provides more knowledge about the diagnosis, treatment, and prevention of cancer.



## *X-raying the Heart Cycle*

**BETHESDA, MD.** With the new cardioerontgen actuator, literally a complex trigger for X-ray machines, the taking of X-rays at known times in the heart cycle need no longer be a matter of guesswork.

Superior diagnosis and treatment of heart ailments can often hinge on the cardiologist's sure knowledge that each successive X-ray picture to be compared, sometimes taken years apart, was shot at exactly the same instant in the heart cycle. The ever-changing normal heart volumes and the subtle enlargements of sick hearts are variables that frequently

deserve precise identification and correlation before two X-ray films can be truly compared.

With the new instrument developed by the Public Health Service at the Laboratory of Technical Development, National Heart Institute, the cardiologist can be assured specific mechanical help in this endeavor.

The photograph illustrates the operation of the instrument. The actuator, housed in a special control box (right) operates in conjunction with a conventional electrocardiograph (left) that continuously traces the heart's electrical activity. This activity is correlated with the expansion and contraction of the heart. The electrocardiographic signal triggers the X-ray exposure at any selected time in the heart cycle.

A monitoring photo cell, hanging

below the patient's elbow in the background of the photograph, detects the X-ray exposure and feeds an electrical pulse back into the electrocardiographic curve, marking the exact instant of exposure. A calibrated switch on the actuator permits proper time selection with respect to heart rate so that films can be taken at full expansion, full contraction, or at any intermediate time. In addition, the instrument contains a provision to prevent double exposure.

The actuator is not yet commercially available. A circuit diagram showing the wiring of the instrument and detailed technical information may be obtained from Dr. Bert R. Boone, chief, Laboratory of Technical Development, National Heart Institute, National Institutes of Health, Public Health Service, Bethesda 14, Md.



*In preliminary studies, human body lice maintained in the laboratory for many generations on lindane, Lauseto neu, and the pyrethrins developed much less resistance to these insecticides than has been developed to DDT. The lice developed no resistance to a pyrethrum-sulfoxide compound after 30 generations.*

## Resistance of Human Body Lice to Insecticides

By GAINES W. EDDY, M.S., M. M. COLE, B.S., MAX D. COUCH, B.S.,  
and ALLEN SELHIME, B.S.

THAT INSECTS can develop resistance to insecticides has been known for approximately 50 years. However, the subject has been studied extensively in this country only during the last 6 years, following the development of resistance to DDT by houseflies. The literature on the development of insect resistance to insecticides has been reviewed by Babers (1) and Babers and Pratt (2). Several important references are given in the Yearbook of Agriculture for 1952.

The laboratory of the Entomology Research Branch of the United States Department of Agriculture conducted research at Orlando, Fla., from June 1951 to August 1954 on the resistance of the human body louse, *Pediculus humanus humanus* L., to DDT, lindane, Lauseto neu (chloromethyl *p*-chlorophenyl sul-

fone), pyrethrins, and pyrethrins plus sulfoxide (*n*-octyl sulfoxide of isosafrole).

Lindane, Lauseto neu, and pyrethrins were selected for study because of their general effectiveness against both normal and DDT-resistant lice. Lindane is of special interest because it has been adopted by the Armed Forces for the control of body lice in areas where resistance to DDT has developed.

The experimental development of resistance has usually been accomplished under laboratory conditions by selection. A concentration of toxicant that will cause moderate to high mortality is used, and the survivors serve as parents of the next generation. In some of the Orlando studies reported here the lice were exposed to very light deposits of insecticides which caused no apparent mortality or injury. The dosages varied with the insecticides, but most of them were approximately one-tenth those usually required to give a low mortality or moribundity.

### Previous Reports on DDT Resistance

A number of workers in the field and in the laboratory have reported on the development of DDT-resistant lice. Bushland and associates in 1945 (3) and Eddy and Bushland in 1948 (4) demonstrated that cloth impregnated

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*The authors are entomologists with the Entomology Research Branch of the United States Department of Agriculture. Mr. Eddy is entomologist in charge of the Corvallis, Oreg., laboratory of the Insects Affecting Man and Animals Section. Mr. Cole and Mr. Couch, with the same section, are stationed at Orlando, Fla., and Mr. Selhime is with the Fruit Insects Laboratory at Orlando.*

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with a 0.05-percent DDT solution or treated with a powder containing 0.1 percent of DDT caused complete or nearly complete mortality of body lice in 24 hours. In 1950, King (5) reported that lice surviving single exposures to DDT at a concentration causing high mortality showed no resistance after several generations.

However, Hurlbut and associates in 1952 (6) failed to control lice on Korean military personnel with a powder containing 10 percent DDT and indicated that the failures were due to resistance. In the same year Barnett and Knoblock (7) showed that body lice in Japan were also resistant to DDT. Data on the susceptibility of the lice in Korea and Japan prior to the general use of DDT in those areas apparently were never obtained.

In 1953, Busvine (8) reported that a strain of lice from Egypt were resistant to DDT but susceptible to other insecticides. Hurlbut and associates (9) reported in 1954 that, after being in general use in Egypt since 1947, 10-percent DDT powder did not control lice any longer, and laboratory tests confirmed some degree of resistance to DDT.

Yasutomi (10) presented laboratory data in 1952 showing that body lice in Japan could develop considerable resistance to DDT in three generations and to BHC in two generations. The lice used by Yasutomi were obtained from vagrants in Ueno in Tokyo, Japan, and he assumed that they had had no previous exposure to either DDT or BHC. However, both chemicals had been available and rather widely used in Japan for several years.

The resistance of body lice in Korea to DDT and several other compounds was studied by Eddy in 1952 (11). He showed the lice in Korea to be at least 100 times more resistant to DDT than a laboratory strain of body lice maintained at Orlando, Fla. However, the resistance of the lice to certain other insecticides tested at the same time was not marked.

The resistant Korean lice were collected from prisoners of war who had been dusted with DDT from time to time during 6 to 9 months. In the tests made in Korea 10-percent DDT powder caused 60 percent mortality during a 24-hour exposure, which indicated that many insects in the population were susceptible.

## Methods of Current Studies

For the current Orlando studies, two lots of lice highly resistant to DDT were obtained from Korea. The standard, or regular, colony was descended from lice collected in the United States before the advent of DDT.

The methods used for rearing the lice were essentially the same as those described by Culpepper (12, 13). The procedures described by Bushland and associates (14) and Eddy (11) were used to test the insecticides as cloth impregnants and as powders.

After rearing the resistant Korean lice for three generations without exposure to insecticides, a portion of one lot was maintained on cloth that had been impregnated with DDT by dipping it into a 0.01-percent solution in acetone. The remainders of the two lots were then combined and maintained on untreated cloth.

At first all Korean lice were fed twice daily on human subjects, but later they were fed on rabbits once each day. The standard colony had been fed on rabbits for a number of years.

## Resistance to DDT

In the tests with the Korean lice maintained on cloth impregnated with 0.01 percent DDT, application of 10 percent DDT caused high but incomplete mortality during the first few generations. However, the resistance gradually increased, and by the 15th generation few or none of the lice were killed in 24 hours.

In another experiment 100 young adult body lice (50 of each sex) from the regular colony, which had had no previous contact with DDT, were placed on cloth impregnated with DDT by dipping it into a 0.001-percent solution. The lice were transferred to freshly impregnated cloth three times weekly. The resistance developed is shown in the table. Most of the data represent averages of 2 tests with 20 lice (10 of each sex) per test and an exposure period of 24 hours. The lice maintained on DDT showed slight resistance by the 5th generation and by the 8th generation were approximately five times as resistant as those of the regular colony. By the 16th generation resistance was very high, but could not be measured accurately as the highest test concentration of DDT (10 percent)



failed to kill all the lice. There was a slight additional increase in resistance by the 25th generation, after which this colony was discontinued.

How much selection, or mortality of susceptible individuals, occurred during the first few generations and whether selection was primarily responsible for the degree of resistance developed were not determined. In subsequent tests to check on these points it was found that adult lice maintained on cloth treated with 0.001 percent DDT did not live quite as long as the controls or lay quite as many eggs. However, the difference did not appear to be sufficient to justify the conclusion that resistance was developed through selection alone.

Other tests indicated that nonresistant lice could be maintained on cloth treated with 0.0001 percent DDT with no more mortality than those maintained on untreated cloth. Accordingly, 2 colonies each with 200 newly hatched nymphs were established on this concentration of DDT and two on untreated cloth. Mortality through seven generations was less for lice exposed to DDT than for the controls. This study is being continued.

#### Loss of DDT Resistance

A portion of the resistant colony obtained from Korea was reared on untreated cloth to determine the number of generations required for the lice to lose their resistance. Loss of

resistance was evident by the third generation and complete by the eighth.

After 17 generations had been maintained on cloth treated with 0.01 percent DDT, another portion of the resistant Korean colony was removed from DDT and reared on untreated cloth. The colony showed practically no loss of resistance after six generations but a considerable loss by the ninth generation. After 9 generations concentrations of 0.1, 1, and 10 percent of DDT caused 45, 75, and 75 percent knockdown and kill, respectively. Little or no further loss was indicated in tests of the 25th generation. Eventually the lice will probably lose their resistance, but apparently many generations will be required.

#### Lindane and Lauseto neu

Development of resistance to lindane and Lauseto neu was attempted by the method described above for DDT, that is, by continuously exposing the lice to sublethal concentrations of the insecticides. The concentrations used were 0.00005 percent for lindane and 0.0025 percent for Lauseto neu. The body lice used in these studies were from the Korean colony that had lost its resistance to DDT. In view of this, resistance to both insecticides, especially lindane, was expected to develop.

Lice of the fifth generation exposed to lindane and Lauseto neu showed no more than twice as much resistance as the regular colony. The

Relative susceptibility to DDT of normal body lice and lice maintained on cloth impregnated with 0.001-percent DDT solution for various numbers of generations

Percent concentration	Percent knockdown and mortality after indicated number of generations									
	5		8		12		16		25	
	DDT	Normal	DDT	Normal	DDT	Normal	DDT	Normal	DDT	Normal
10.0					90		95		90	
5.0					100		88		85	
1.0					100		90		70	
0.1	100	100			90		75		55	
0.05			100		95		65	100	75	
0.025	98	98	80	100	65	100	48	98	45	100
0.01	78	98	60	100	70	95	18	95	15	95
0.005	73	98	50	85	35	55	13	83	5	80
0.0025	45	93	40	45	0	45	0	65	0	10
0.001	10	43	10	5	0	5	3	5	0	0
Control (untreated)		13		0		0		0		0



lice have now been reared through 34 generations without any further increase in resistance to either material. The amount of resistance developed thus far is so slight that it seems well within the variation expected with any insecticide.

### Pyrethrins and Pyrethrins Plus Sulfoxide

The lice used in studies with pyrethrins were taken from the regular colony, which had had no previous contact with DDT or other insecticides. As in the tests with the other materials, the lice were maintained on cloth treated with sublethal concentrations—0.001 percent of pyrethrins alone and 0.0001 percent of pyrethrins plus 0.001 percent of sulfoxide. No more than twofold resistance to pyrethrins was indicated in tests against different generations of lice up to and including the 17th, at which time the colony was discontinued. The pyrethrum-sulfoxide colony appeared to be no more resistant than the regular colony after 30 generations. Studies with this colony are being continued.

### Summary

Studies were conducted on the development and loss of resistance of the body louse (*Pediculus humanus humanus* L.) to DDT, lindane, Lauseto neu (chloromethyl *p*-chlorophenyl sulfone), pyrethrins, and pyrethrins plus sulfoxide. The more important findings are:

1. Highly but not completely DDT-resistant body lice from Korea lost their resistance in 3 to 8 generations when maintained in a DDT-free environment.

2. DDT-resistant lice from Korea developed extreme resistance in 15 generations when maintained on cloth impregnated with a 0.01-percent DDT solution.

3. Extremely resistant lice lost approximately 75 percent of their resistance in 15 generations after being removed from contact with DDT.

4. Body lice from the regular colony, which had never been exposed to DDT, developed a high resistance in 25 generations when maintained on cloth impregnated with 0.001 percent of DDT. There was a very low mortality in the initial exposures, but resistance developed.

5. Body lice maintained for 34 generations

on cloth impregnated with low concentrations of lindane and Lauseto neu and 17 generations on pyrethrins failed to develop more than twofold resistance to these insecticides. Lice maintained on pyrethrins plus sulfoxide failed to develop any resistance in 30 generations.

### REFERENCES

- (1) Babers, F. H.: Development of insect resistance to insecticides. U. S. Bureau Entomology and Plant Quarantine E-776. Washington, D. C., The Bureau, 1949, 31 pp. Processed.
- (2) Babers, F. H., and Pratt, J. J.: Development of insect resistance to insecticides. II. A critical review of the literature up to 1951. U. S. Bureau Entomology and Plant Quarantine E-818. Washington, D. C., The Bureau, 1951, 45 pp. Processed.
- (3) Bushland, R. C., McAlister, L. C., Jr., Jones, H. A., and Culpepper, G. H.: DDT powder for the control of lice attacking man. *J. Econ. Ent.* 38: 210-217, February 1945.
- (4) Eddy, G. W., and Bushland, R. C.: Compounds more toxic than DDT against body lice. *J. Econ. Ent.* 41: 369-373, March 1948.
- (5) King, W. V.: DDT-resistant house flies and mosquitoes. *J. Econ. Ent.* 43: 527-532, April 1950.
- (6) Hurlbut, H. S., Altman, R. M., and Nibley, C., Jr.: DDT resistance in Korean body lice. *Science* 115: 11-12, Jan. 4, 1952.
- (7) Barnett, H. C., and Knoblock, E. C.: Chemical and biological studies on DDT resistance of lice. *U. S. Armed Forces M. J.* 3: 297-304, February 1952.
- (8) Busvine, J. R.: Forms of insecticide-resistance in houseflies and body lice. *Nature, London* 171: 118-119, Jan. 17, 1953.
- (9) Hurlbut, H. S., Pelly, R. L., and Abdel Aziz Salah: DDT resistance in Egyptian body lice. *Am. J. Trop. Med. & Hyg.* 3: 922-929, May 1954.
- (10) Yasutomi, K.: Studies on the insect-resistance to insecticides. I. Development of resistance of human body louse, *Pediculus humanus corporis* Deg., to DDT and BHC. *Rotyu-Kagaku* 17: 41-44 (1952).
- (11) Eddy, G. W.: Effectiveness of certain insecticides against DDT-resistant body lice in Korea. *J. Econ. Ent.* 45: 1043-1051, June 1952.
- (12) Culpepper, G. H.: The rearing and maintenance of a laboratory colony of the body louse. *Am. J. Trop. Med.* 24: 327-329, May 1944.
- (13) Culpepper, G. H.: Rearing and maintaining a laboratory colony of body lice on rabbits. *Am. J. Trop. Med.* 28: 499-504, March 1948.
- (14) Bushland, R. C., McAlister, L. C., Jr., Eddy, G. W., Jones, H. A., and Knipping, E. F.: Development of a powder treatment for the control of lice attacking man. *J. Parasitol.* 30: 377-387, June 1944.

# Sanitary Engineering Degrees Given in 1954

By ARTHUR P. MILLER, C.E.

IN 1954 in the United States, there were 164 graduates from undergraduate sanitary engineering courses. Graduate degrees granted consisted of 120 master's and 9 doctor's.

*Mr. Miller is sanitary engineer director in the Division of Sanitary Engineering Services, Public Health Service.*

The institutions awarding the degrees are shown in the table. Similar data for undergraduates during the periods 1889-1950, 1951-52, and 1953, and for those awarded master's and doctor's degrees during the 54-year period 1899-1953 have been presented in earlier reports by the author (see list).

## Undergraduate Degrees

All but 8 of the 40 colleges and universities reporting the availability of undergraduate courses in sanitary engineering had one or more graduates in 1954. There were 216 graduates in 1953 and an average of 242 per year for the 5-year period 1949-53. The number of graduates per 1,000 engineering graduates was 7.5 in 1954; 9.0 in 1953; and 6.2 in the 5-year period 1949-53.

Number of degrees in sanitary engineering, by level, granted in the United States, 1954

Institution <sup>1</sup>	Doc- tor's	Mas- ter's	Bach- elor's	Institution <sup>1</sup>	Doc- tor's	Mas- ter's	Bach- elor's
Alabama Polytechnic Institute.....		0	0	Newark College of Engineering.....	0	3	6
Alabama, University of.....		0	2	North Carolina State College.....	0	1	0
Arkansas, University of.....		1		North Carolina, University of.....	0	9	10
California, University of.....	0	9	11	Ohio State University.....	0	1	3
Case Institute of Technology.....		1		Oklahoma Agricultural and Me- chanical College.....	0	0	3
Colorado, University of.....		0	4	Oklahoma, University of.....		1	0
Cornell University.....	0	0	3	Oregon State College.....	0	1	4
Florida, University of.....		2	3	Pennsylvania State University.....	0	3	7
Georgia Institute of Technology.....		1	2	Purdue University.....	0	3	0
Harvard University.....	2	20		Rensselaer Polytechnic Institute.....		0	4
Illinois, University of.....	1	5	4	Rutgers University.....		0	1
Iowa, State University of.....	0	3	4	Santa Clara University.....			0
Johns Hopkins University.....	1	8		Southern California, University of.....		3	
Kansas, University of.....		0	5	Texas, Agricultural and Mechani- cal College of.....	0	0	7
Louisiana State University.....		0	1	Texas, University of.....	0	2	2
Maine, University of.....			17	Tulane University of Louisiana.....		0	0
Manhattan College.....				Utah State Agricultural College.....			1
Massachusetts Institute of Tech- nology.....	3	9	5	Utah, University of.....	0	1	
Michigan College of Mining and Technology.....		0	11	Virginia Polytechnic Institute.....	0	5	12
Michigan State College.....	0	2	2	Washington, State College of.....		2	
Michigan, University of.....	0	10	2	Washington, University of.....	0	3	
Minnesota, University of.....	0	3	0	Wayne University.....		0	0
Mississippi State College.....	0	0	22	West Virginia University.....		0	1
Missouri School of Mines and Metallurgy.....	0	0	5	Wisconsin, University of.....	2	1	3
Missouri, University of.....	0	3	2				
New York University.....	0	4	5	Total.....	9	120	164

Leaders (.....) indicate no courses offered at this level.

<sup>1</sup> Other institutions offering sanitary engineering courses at the master's (m) or doctor's (d) level are: California Institute of Technology (d); Connecticut, University of (m); Idaho, University of (m); Illinois Institute of Technology (m, d); Iowa State College (m, d); Kentucky, University of (m); North Dakota, University of (m); Northwestern Technological Institute (m, d); South Dakota State College (m); Tennessee, University of (m); and Wyoming, University of (m).

### Master's Degrees

Of the 120 master's degrees granted in 1954, 25 were awarded to nationals of foreign countries. Thirty, or 54 percent, of the 56 institutions offering graduate work in sanitary engineering at the master's level had graduates. Eight universities conferred 75 of the 120 degrees and 22 other universities awarded the remaining 45 degrees.

The number of master's degrees granted in 1953 was 102, of which 20 were earned by foreign nationals. The average number of master's degrees granted for the 5-year period 1949-53 and the 10-year period 1944-53 were 129 and 108, respectively.

### Doctor's Degrees

The 9 doctor's degrees awarded in 1954 by 5 institutions were all to nationals of the United States. In 1953, 5 doctor's degrees, 3 of which were to foreign nationals, were granted. In the 5-year period, 1949-53, the average number of

degrees conferred per year was 6; in the 10-year period, 1944-53, it was 4.

Twenty-one universities offering work at the doctor's level had no successful candidates in 1954 (see footnote to the table).

### PREVIOUS REPORTS

Doctorate degrees in sanitary engineering. Washington, D. C., U. S. Public Health Service, 1952. Multilithed.

Graduates from undergraduate sanitary engineering courses in the United States. Pub. Health Rep. 66: 369-374, Mar. 23, 1951.

Graduates from undergraduate sanitary engineering courses in the United States in 1952. Washington, D. C., U. S. Public Health Service, 1952. Multilithed.

Graduates from undergraduate sanitary engineering courses in the United States in 1953. Washington, D. C., U. S. Public Health Service, 1953. Multilithed.

Master degrees in sanitary engineering. Washington, D. C., U. S. Public Health Service, 1953. Multilithed.

Master's and doctor's degrees in sanitary engineering in 1953. Washington, D. C., U. S. Public Health Service, 1954. Multilithed.

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## PHS Staff Announcements

**Dr. Kenneth W. Chapman**, a specialist in narcotic addiction programs, has been assigned to the Community Services Branch of the National Institute of Mental Health. Dr. Chapman will provide consultative services to State and community governmental agencies and voluntary organizations on the prevention, treatment, and control of drug addiction. He has been executive secretary of the Public Health Service Committee on Drug Addiction.

Graduated from Yale Medical School in 1938, Dr. Chapman entered the Service the following year. Since 1946, he has worked on medical problems of drug addiction, principally at the Public Health Service Hospital in Lexington, Ky., where he was medical officer in charge from 1952-54. In 1955 he became head of the Neuropsychiatry Branch of the Division of Hospitals of the

Bureau of Medical Services, Public Health Service.

**Dr. John W. Knutson**, chief dental officer and Assistant Surgeon General of the Public Health Service, has been assigned to the World Health Organization for 6 months in order to organize a dental program. Dr. Knutson took over his duties in Geneva on July 1, 1955. Last year he was chairman of an international group of dental consultants convened in Geneva by the World Health Organization, and currently he is vice president of the Public Dental Health Services Commission of the Federation Dentaire Internationale. Dr. Knutson was a founding member of the American Board of Dental Public Health.

# Pennsylvania's Aid To Cities in Financing Sewage Treatment Plants

By CHARLES H. YOUNG

PENNSYLVANIA, under 1953 legislation, is helping municipalities defray the cost of operating sewage treatment plants required by the State for the control of water pollution.

Earlier legislation, enacted in 1937, and known as the clean streams law, required construction of the plants. Both the construction and operation costs were to be borne by the municipalities.

The new act, No. 339, marks a change of thinking on the part of the Pennsylvania Legislature since it begins a program of annual subsidies to be paid to municipalities to assist in meeting the costs of the sewage treatment works.

The intent of the Pennsylvania General Assembly was set forth in the preamble of the 1953 act. The preamble is quoted in part and the main provisions are summarized on the following page.

## Rules and Regulations

The Pennsylvania Department of Health prepared rules and regulations for the administration of the act. It also prepared application forms for the use of municipalities and municipality authorities in filing construction costs. The rules and regulations are intended primarily to clarify the eligibility of projects, or parts of projects, or items entering into the cost of construction. They stipulate what is required in a general drawing to accompany the applications to show clearly the project for which payment is requested. They explain proportioning costs of projects or parts of projects

when the total project involves more than is eligible for payment consideration. Under the regulations the costs of acquisition or construction are exclusive of grants or equivalent funds received from the State or Federal Government. The regulations further provide for payments to be made to other than the applicant, since many of the municipal authority projects are operated by the municipality under a lease-back agreement. The regulations also require the documentation of costs and provide for other features.

Allowed in determining the cost of acquisition or construction, or both, of the sewage treatment works, intercepting sewer, and pump station are: cost of the plant or pump station site, or both, and rights of way; engineering costs of the report, plans, specifications, supervision and inspection of construction; contract cost for the allowable treatment facilities and appurtenances, including supplemental contracts; financial costs; legal costs, and interest during construction. All cost data must be documented, and breakdowns of the construction costs and other costs are required where such breakdowns are necessary to establish clearly the cost eligibility of the project.

## Experience to Date

A few of the municipalities have experienced difficulties in documenting the costs of their projects, particularly projects constructed in the years shortly after the effective date, September 1, 1937, of the clean streams law. These difficulties, however, have been reduced to date to several cases which are being handled on an individual basis.

A total of 124 applications were filed. For various reasons, the number has been reduced to 103. To date, 92 applications have been processed and the municipalities or municipality authorities have been paid a total of \$798,920.28. These municipalities received 2 percent of the approved costs. The remaining applications are in process.

Even though this legislation was given considerable publicity and form letters were mailed to all municipalities that were believed entitled to payment, a few Pennsylvania municipalities did not take advantage of this legis-

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"Whereas, The Commonwealth of Pennsylvania under the Act of Assembly approved the twenty-second day of June, one thousand nine hundred thirty-seven (Pamphlet Laws 1987), has required certain municipalities of this Commonwealth to construct sewage treatment plants to abate the pollution of the waters of the Commonwealth and thereby preserve and improve the purity of such waters in the interest of the public health; and,

"Whereas, these municipalities have in the past and will in the future expend large sums of money to acquire and construct sewage treatment plants in accordance with the Clean Streams Program and the aforesaid Act of Assembly, which sewage treat-

ment facilities benefit not only the local municipality but are a benefit to all of the citizens of the Commonwealth of Pennsylvania; and,

"Whereas, the responsibility to preserve and improve the purity of the waters of the Commonwealth does not rest solely upon municipal government but is also a function and responsibility of State government acting in the interest of the general public health, the Commonwealth of Pennsylvania, in consideration of the benefits resulting from the acquisition and construction, both in the past and in the future, of sewage treatment plants by municipalities . . ."

### Main Provisions

1. Commencing July 1, 1954, and annually thereafter, the Commonwealth shall pay toward the cost of operating, maintaining, repairing, replacing, and other expenses relating to sewage treatment plants, an amount not to exceed 2 percent of the costs for the acquisition and construction. The annual payments are to be made to municipalities and municipality authorities which have acquired and constructed sewage treatment works since September 1, 1937. The payments are to be made for the year up to and including December 31 of the year preceding the year in which such payment is made, and as is ascertained by the secretary of health and approved by the Governor.

2. The word "construction" shall include, in addition to the construction of new treatment works,

pumping stations, and intercepting sewers, which are integral parts of the treatment facilities, the altering, improving, or adding to of existing treatment works, pumping stations, and intercepting sewers which are essential to the sewage treatment plant system.

3. The Pennsylvania Department of Health is authorized to promulgate rules and regulations for the administration of the act.

4. The amounts to be paid for the foregoing purposes shall be based upon reports filed with the secretary of health prior to January 31, 1954, and annually thereafter.

5. The sum of \$2 million was appropriated to initiate payments to the municipalities and municipality authorities.

lation by filing applications for payment in 1954.

The reaction to this legislation has been generally favorable. It has been particularly favorable from municipalities which have constructed plants in recent years under high costs and from those municipalities which are preparing to construct plants.

The payments to municipalities to date have ranged from a minimum of \$116.07 to a maximum of \$209,591.72. The latter represents a partial payment; the full payment will amount

to approximately \$250,000. The 2-percent annual payment is estimated to represent approximately 15 to 30 percent of the total annual operating expenses, including debt service, depending on the nature of the project. The payments may be used to reduce annual operating costs of the works, thereby reducing the annual sewer rental costs, or to accelerate debt retirement, or a combination of these. It will be interesting to see whether subsequent legislatures will make appropriations to continue the subsidy payments.

## Cardiovascular Disease

Data on mortality, prevalence, and control activities

*Public Health Service Publication No. 429. 1955. 68 pages.*

Designed particularly for use by workers in the heart disease field, this booklet provides information on the mortality and prevalence of cardiovascular-renal disease and on heart disease control activities.

In general, the data permit comparisons among various population groups, among States, or among geographic regions. Also shown are results of case finding among various population groups and for various screening techniques.

## Manual of Serologic Tests for Syphilis

*Public Health Service Publication No. 411, revised 1955. 106 pages; illustrated. \$1.00.*

The latest technical procedures to be observed in the performance of each of the reliable, evaluated serologic tests for syphilis now commonly employed in the United States have been assembled in this manual by the Venereal Disease Research Laboratory in collaboration with the test manual-serologists.

Included are the APHA, Hinton, Kahn, Kline, Kolmer, Mazzini, Rein-Bossak, and VDRL tests as well as chapters on general information and general equipment. The appendix describes methods of collection and preservation of sheep blood, preparation of hemolysin, preparation and preservation of complement, use of merthiolate as a bacteriostat, and quantitative determination of spinal fluid protein.

Especially designed for use in laboratories, the manual has a plastic-coated cover and plastic comb binding. It is the fifth edition of the Manual of Serologic Tests for

Syphilis published by the Venereal Disease Program, previously issued as supplements 9, 11, and 22 to the Journal of Venereal Disease Information and VD-Graphic \$5.

## A Comprehensive Program for Water Pollution Control

*Central Columbia River Basin. Public Health Service Publication No. 381. Water Pollution Series No. 69. 1954. 20 pages; illustrated.*

Adopted by the Public Health Service from a program developed by the Washington Pollution Control Commission in cooperation with the State Department of Public Health, this program is based on beneficial water uses and related conditions that prevailed on January 1, 1954.

*Green Bay Western Shore Drainage Basin. Public Health Service Publication No. 368. Water Pollution Series No. 67. 1955. 42 pages; illustrated.*

Developed in cooperation with the State Water Pollution Control Agencies of Michigan and Wisconsin and Federal agencies and adopted by the Public Health Service, this program is based on data available as of January 1, 1954.

*Lake Superior Drainage Basin. Public Health Service Publication No. 367. Water Pollution Series No. 66. 1954. 51 pages.*

Program prepared in cooperation with the Michigan, Minnesota, and Wisconsin water pollution control agencies on data available as of January 1, 1954.

*Mississippi-Iowa-Cedar Rivers Basin. Public Health Service Publication No. 346. Water Pollution Series No. 61. 1955. 41 pages.*

Adopted by the Public Health Service from a program developed by the Illinois, Iowa, and Minnesota State

water pollution control agencies, based on beneficial water uses and related conditions that prevailed on July 1, 1953.

*Mississippi-Salt Rivers Basin. Public Health Service Publication No. 366. Water Pollution Series No. 65. 1954. 24 pages; illustrated.*

Adopted by the Public Health Service from a program developed by the Illinois, Iowa, and Missouri State water pollution control agencies, based on beneficial water uses and related conditions that prevailed on January 1, 1954.

*Mississippi-Wapsipinicon and Tributaries Rivers Basin. Public Health Service Publication No. 347. Water Pollution Series No. 62. 1954. 47 pages; illustrated.*

Adopted by the Public Health Service from a program developed by the Illinois, Iowa, Minnesota, and Wisconsin State water pollution control agencies, based on the beneficial water uses and related conditions that prevailed on July 1, 1953.

## Salaries of Local Public Health Workers, August 1954

*Public Health Service Publication No. 425. 1955. 41 pages.*

This report contains data from the 5th study of salaries of selected classifications of public health workers in official agencies and from the 15th study of public health nurses employed by local nonofficial health agencies and local boards of education.

Presented are salary data by \$200-intervals, according to population group served and by regions of the Department of Health, Education, and Welfare, for each of the following occupations:

Local health officers (medical), public health physicians (exclusive of health officers), sanitary engineers, sanitarians (including other sanitation personnel), veterinarians, professional laboratory workers, health educators, and public health nurses (supervising, staff, and clinic).

# technical publications

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## Meeting the Challenge of Cancer

*Public Health Service Publication No. 419. 1955. 23 pages. 15 cents.*

This booklet supplements *The Challenge of Cancer*, a 116-page book by Lester Grant, published in 1950 under the joint sponsorship of the National Cancer Institute of the Public Health Service and the National Cancer Institute of Canada. It presents some of the accomplishments in cancer research since that time.

In the supplement, prepared by the National Cancer Institute, the first section delineates the sources of financial support for cancer research and the programs of leading organizations. It also discusses the post-war shift in emphasis from basic to clinical research. The next two sections deal with advances in diagnostic and therapeutic technique and with promising areas of research in these fields. The chemotherapy of cancer is given special attention in a separate section; a review of recent studies in the epidemiology of cancer and a list of source materials complete the supplement.

## Grant and Award Programs of the National Institutes of Health

*Public Health Service Publication No. 415. 1955. 22 pages.*

Scientists, public health workers, students, and others interested will find in this publication comprehensive information about the grant and award programs authorized by the Public Health Service Act and administered by the National Institutes of Health, - Public Health Service. Details are given for the types, scope, and purposes of the grants and

awards; availability of funds; eligibility requirements for recipients; location of training; and opportunities afforded trainees.

The grants and awards are offered to encourage and support research, investigation, and training in health, medical, dental, and allied fields for which other funds have not been provided or which might not otherwise be conducted. ♦

## Evaluation in Mental Health

*A review of the problem of evaluating mental health activities*

*Public Health Service Publication No. 413. 1955. 292 pages. \$2.00.*

Problems and processes of evaluative studies are reported from a survey made by a subcommittee of the National Advisory Mental Health Council. The survey, begun in 1951, was designed to assist professional workers in improving the scientific basis for mental health programs and in evaluating the effects of their practical operations.

The report of this survey assembles an annotated bibliography of the evaluative studies and presents observations and suggestions arising from collection and analysis of the materials.

## Reported Tuberculosis Morbidity and Other Data Calendar Year 1953

*Public Health Service Publication No. 442. 1954. 27 pages. 25 cents.*

This second published summary of the data supplied to the Public Health Service on the annual tuber-

culosis report form PHS-1393 tabulates newly reported tuberculosis cases by source of morbidity report, activity status, form and extent of the disease, race, sex, and age. Data on X-ray case-finding activities, mortality, and public health nursing visits are also included.

The data, received from all the States, the District of Columbia, Alaska, Hawaii, and Puerto Rico, are intended primarily for reference use. Summaries giving limitations and uses of the data are prepared for each analytical table.

## Meeting Community Health Needs

*Public Health Service Publication No. 403. (Revision of You'll Want to Know About Your Hospital Program, PHS Pub. No. 8, May 1951.) Revised 1954. 1-fold leaflet.*

Operation of the Hospital and Medical Facilities Survey and Construction (Hill-Burton) Act is explained in this leaflet. It tells what community facilities are eligible to receive Federal assistance under the law as amended in 1954. And it explains the application requirements and procedures for obtaining Federal assistance in building a hospital or related health facility. The agency administering the hospital and medical facilities survey and construction program in each State is listed.

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This section carries announcements of all new Public Health Service publications and of selected new publications on health topics prepared by other Federal Government agencies.

Publications for which prices are quoted are for sale by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. Orders should be accompanied by cash, check, or money order and should fully identify the publication. Public Health Service publications which do not carry price quotations, as well as single sample copies of those for which prices are shown, can be obtained without charge from the Public Inquiries Branch, Public Health Service, Washington 25, D. C.

The Public Health Service does not supply publications issued by other agencies.

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## Emergency Handling of Frozen Foods

By JOHN B. HOZIER, M.D., M.P.H., and JAMES A. ANDEREGG, C.E., M.S.

**I**N HIS REPORT on Hurricane Carol, which swept through New England in September 1954, the Public Health Service regional medical director in that area observed: "An interesting phase of the recent disaster was that the primary public problem arose from the loss of electric service. With the loss of electric power, food freezing and storage equipment

failed and large quantities of perishable food in wholesale lots had to be disposed of in such a manner that it would not be scavenged."

With the great expansion of the frozen food industry during the past decade, the emergency handling of frozen foods has become increasingly important. In this paper, we shall consider two major types of emergencies: those due to possible contamination of the food in the event of enemy attack with radiological, biological, or chemical weapons and those due to failure of the refrigerating mechanism, such as occurred in the wake of Hurricane Carol. Many questions concerning the problems posed by these emergencies remain to be answered, but a few guidelines have been developed for use in planning to meet them.

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*Dr. Hozier is chief of Health Emergency Planning, Office of the Surgeon General, Public Health Service, and Mr. Anderegg is sanitary engineering consultant with this unit. The paper was presented at the 1955 meeting of the Southern Branch of the American Public Health Association in New Orleans, La.*

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## Protection From Contamination

Much has been written in recent months about the hazards of radioactive fallout following an enemy attack with atomic weapons. As far as is known now, the danger to frozen foods probably can be dismissed with the comment that such foods in unbroken packages should be safe. Frozen food in homes is not only packaged, but it is also kept in well-insulated and closed refrigerators or freezing units. Frozen food in commercial storage has the additional protection of well-constructed, heavily insulated, and tightly sealed buildings.

To verify the assumed safety of packaged food products, the Federal Civil Defense Administration sponsored a series of tests on the ability of such foodstuffs to withstand atomic blasts during the atom bomb testing program in Nevada. The tests were directed by the Food and Drug Administration in cooperation with the Department of Agriculture and private industry. One of the tests, conducted in the spring of 1955 with cooperation from the Association of Frozen Food Manufacturers, concerns frozen foods and frozen food containers, and FCDA is expected to publish the findings in the near future. It will be interesting to see whether packaged frozen foods under actual conditions of an atomic blast come up to the expected standards of safety.

Frozen foods in unbroken packages are also fairly well protected from contamination by biological or chemical agents. In the manual, "Defense Against CBR Attack," the Department of Defense has tabulated the effectiveness of various types of protective packaging (1). Sealed cans, according to the manual, afford complete protection against vapors, liquids, biological organisms, and radioactive dusts. Cellophane and metal foil packaging provide complete protection if all joints are tight and if the cellophane has been kept dry. Ordinary paper containers furnish only poor to good protection against these four types of contamination. These evaluations, however, are pertinent only to situations in which the food is protected by packaging alone, that is, where the food is outside a home freezer or where a contaminating agent has been introduced into a commercial freezer warehouse. As previously noted, the nature of the home freezing unit and

of the commercial warehouse normally assures that known contaminating agents will not penetrate as far as the individual food packages.

## Preservation During Power Failure

Failure of electric power, which was the cause of a food handling emergency during Hurricane Carol, has occurred frequently as a result of natural disasters. In planning for an unexpected, prolonged period without electricity, consideration must be given to the preservation or the consumption of large quantities of frozen and refrigerated foods so that spoilage will be held to a minimum.

The first and most obvious question in regard to this type of emergency is: How long can frozen foods be kept either in a home freezer or in a refrigerated warehouse before they begin to spoil? The answer is elusive and variable and is dependent on several factors. Tests by the Department of Agriculture indicate, however, that frozen foods can be stored in a typical small home freezer without power for about 3 days (2). The National Association of Refrigerated Warehouses reports that an informal survey among its members drew responses of anywhere from 1 day to 2 weeks in answer to the question: How long will your warehouse store frozen food without power?

Among the many factors that determine the length of time frozen foods can be kept without spoiling during a power failure in either a home freezer or a commercial warehouse are these:

1. Type, quantity, and condition of the insulation of the freezer or warehouse.
2. Temperature within the freezer or warehouse at the time of power failure. The colder the food, the longer it will stay frozen.
3. Type of products stored. Frozen meats, for example, will absorb heat much more slowly than frozen baked foods.
4. How full the freezer or warehouse is at the time of power failure. Generally, a full freezer will hold frozen foods hours longer than an almost empty one. Thus, once the power has failed, frozen foods serve as a temporary refrigerant in delaying temperature rise. By the same reasoning, a large box will keep foods frozen longer than a small one.

5. Whether or not it becomes necessary to open a freezer or warehouse. This is the most important of all the factors influencing holding time. Once power has stopped, frozen food storage units should not be opened except to transfer the food elsewhere or to add dry ice.

When available, dry ice is the best deterrent to temperature rise, particularly in home freezers. In preparing a community to meet disasters which may entail power failure, officials should locate nearby dry ice manufacturing plants and arrange for large quantities to be delivered, by air if necessary, and distributed during the emergency. Despite the heavy loss of food in New England as a result of Hurricane Carol, considerable quantities of frozen foods which otherwise might have spoiled were preserved with dry ice flown in from communities not affected by the storm.

If dry ice is not available, ordinary ice may be used to prolong the storage life of frozen foods, but it should be used only when the foods show evidence of thawing. Ordinary ice should not be added until foods have begun to soften, since ice temperature usually is just below 32° F., whereas frozen foods normally are stored at about 0° F.

Admittedly, the time may arrive during a period of power failure when it is no longer possible to refrigerate frozen food. Dry ice or ordinary ice, even if available initially, may have been exhausted, and temperatures in home freezers and refrigerated warehouses may have risen so that the foods would spoil if not further preserved. It must be remembered that because of the rupture of cellular structure during freezing, foods that have been frozen deteriorate much more rapidly after thawing than do fresh foods.

Almost any method of preserving fresh food—canning, cooking, salting, smoking—can be used to preserve food that has been frozen. Corned beef may not enjoy as much popularity as a sizzling steak, but most housewives have salt on the pantry shelf and putting a choice cut of meat into a brine solution seems preferable to having to discard it after it has spoiled. Similarly, if heavy spoilage losses are to be avoided, operators of frozen food warehouses must be prepared to cook, or otherwise preserve,

thawing food, or to distribute it quickly to persons who can.

## Civil Defense Planning

In communities near freezer warehouses, frozen foods may constitute an excellent emergency resource for use in mass feeding operations during a disaster. As pointed out earlier, frozen foods stored in warehouses which remain intact after an enemy attack probably would be safe from contamination. And, because of the imminent danger of food spoilage under assumed conditions of electric power failure, such foods would have to be consumed within a few days. Although some warehouses do have auxiliary diesel electric powerplants, the percentage of warehouses so equipped is relatively small. A proper activity for civil defense officials might be to convince warehouse operators of the advisability of equipping their refrigerated storage units with auxiliary power. From a dollars-and-cents viewpoint, a standby diesel generating unit would seem to be a matter of good business.

As an approach to eventual solution of the many problems involved in protection of foods in time of emergency, the National Research Council, at the request of the Food and Drug Administration, has appointed a committee of experts in food technology to study the subject. The stated purpose of this committee is: "To consider the present preparedness of the food processing and warehousing industry with respect to its vulnerability to overt or covert special weapons attack. If necessary, to recommend corrective measures, or research to develop corrective measures, which will reduce the vulnerability." The National Research Council has been asked to report on the following specific items:

"1. The points where food and the major food processing industries are most vulnerable to overt or covert attack with special weapons.

"2. Corrective measures, or research needed to develop corrective measures, which will reduce this vulnerability.

"3. The suitability of existing facilities and practices for sanitizing or decontaminating food plants, equipment and products in a civil defense emergency.

"4. Any further facilities or practices needed for sanitizing or decontaminating food plants, equipment and products in a civil defense emergency."

It is understood that the study committee's report, anticipated late this year, will include an evaluation of problems in handling frozen foods.

### Guides to Preparedness

Despite the many unanswered questions, certain actions can be taken now by local officials in preparation for preservation and proper use of frozen foods during an emergency period:

1. Locate existing refrigerated warehouses and encourage operators to provide auxiliary power sources if they have not already done so. Such standby power could save not only the frozen food stored in the warehouse, but also individual homeowners' stocks, which could be transferred to the warehouse until power is restored in the area.

2. Encourage decentralization of new warehouses away from centers of likely target cities.

3. Locate dry ice manufacturing plants and plan for prompt distribution of dry ice to owners of home freezer units in event of power failure. This may include planning for importation of dry ice if it is not manufactured locally.

4. Educate the public on procedures to follow in the event of power failure. The individual

home owner should know that dry ice is, or is not, available—and where; that freezer units should be kept closed insofar as possible; and that frozen meats and other frozen foods can be preserved for later use only by cooking or otherwise preserving them as soon as they begin to thaw.

5. Prepare an estimate of the numbers and capacities of mobile freezer units, such as trucks and railway cars, that may be available. Some frozen food, particularly that stored in warehouses, might be saved by transfer to these vehicles.

6. To meet the eventuality that all possible sources of power may be destroyed, a plan should be prepared for rapid distribution of large stocks of frozen foods to minimize waste.

We all hope, of course, that the occasion for the use of emergency measures may never arise in our own communities. However, the annual number of natural disasters alone is ample indication of the immediate need for planning the preservation of the Nation's food supply during an emergency.

### REFERENCES

- (1) U. S. Department of the Army: Defense against CBR attack. Field manual 21-40. Washington, D. C., U. S. Government Printing Office, 1954.
- (2) U. S. Department of Agriculture: What to do when your home freezer stops. Leaflet 321. Washington, D. C., U. S. Government Printing Office, 1952.

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## Departmental Announcement

**Herold C. Hunt, Ed.D.**, Charles William Eliot professor of education at Harvard University, and former general superintendent of schools in Chicago, was appointed Under Secretary of Health, Education, and Welfare by President Eisenhower on Sept. 2, 1955. For more than 25 years, Dr. Hunt has held responsible



administrative positions in public schools, among them superintendencies at St. Johns, Mich.; Kalamazoo, Mich.; New Rochelle, N. Y.; and Kansas City, Mo. He has also lectured at summer sessions of several universities. He has held important positions on many professional education associations, serving as president of the American Association of School Administrators from 1947 to 1948, and as chairman of the American Council on Education in 1948-49.

# Recommendations for the Improvement of Fetal Death Statistics

*A report by the United States National Committee on Vital and Health Statistics. The committee was formed by the Surgeon General of the Public Health Service at the request of the Department of State in accordance with the recommendations of the First World Health Assembly, 1948. The major objectives of the committee, of which Dr. Lowell J. Reed, Johns Hopkins University, is chairman, are to promote and secure technical developments in the field of vital and health statistics for national and international use.*

. . .

FETAL MORTALITY is a problem of considerable importance in the United States today. Estimates indicate that fetal deaths now represent a medical and social problem of equal or greater magnitude than that of infant mortality at the turn of the century. In view of this, it seems important that health interests throughout the country turn more attention toward this problem.

More reliable and complete data on fetal mortality are needed to identify the problems in a more precise manner. As a step toward obtaining improvement in fetal death registration, and the reporting, classifying, and tabulating of causes of fetal deaths, the United States National Committee on Vital and Health Statistics is proposing certain recommendations. These recommendations and background information on their development are presented in this report.

Early in 1951 the National Committee on Vital and Health Statistics established a Subcommittee on Causes of Fetal Death. Its major

objective was to recommend methods for improving the recording and processing of statistics on fetal deaths so that they would be more suitable for use in studies of medical and social factors related to these fatalities.

A preliminary review and summary (1) sponsored by the national committee indicated the magnitude of the problem and its many ramifications. Most important is the extraordinarily large number of deaths for which the cause is either unknown or is reported in ill-defined terms.

One of the greatest deterrents to adequate progress in the field, it was thought, was the lack of clear-cut and acceptable definitions of terms such as stillbirth, abortion, evidence of life, prematurity, and viability. The adoption by the Third World Health Assembly in 1950 of definitions of live birth and fetal death and a number of accompanying recommendations was an important constructive step in the field (2), making it unnecessary to use "stillbirth," "abortion," and "viability" for vital statistics purposes. However, many important problems remain, particularly with regard to the application of definitions.

Basic problems in the recording and classifying of causes of fetal death stem from the difficulty of relating clinical observations during the life process to pathological findings and are further complicated in that two individuals must be considered, the fetus and the mother. As a result, recorded causes often go no further than describing terminal condition and provide little data on underlying causes.

This lack of knowledge of underlying causes, especially in the group of antepartum deaths,

is probably responsible for the prevailing feeling of apathy on the part of the clinician in his approach to the problem. There is a discouraging lack of useful information on most clinic records of maternity patients. The same feeling of apathy is evident in the field of vital statistics and is reflected in the fact that few, if any, tabulations on causes of fetal deaths are prepared in the local, State, and national offices of vital statistics.

It was recognized, from the beginning, that there are two major tasks requiring attention. One relates to specific problems: definitions, medical certification, classification, and the like. The other, a broader function, is that of acting as a coordinating force for groups concerned with the problem of fetal loss.

It was also recognized that, to do effective work in either of these areas, the subcommittee's activities must be linked to and must benefit from the experience and knowledge of the physicians practicing obstetrics, pediatrics, and of related professional groups. The subcommittee operated on the basic principle that sources of information outside the group were to be utilized to a maximum in arriving at recommendations. This led to conducting a major survey of medical opinion, testing of a form in two hospitals, review of case histories of fetal deaths, and examination of tabulations of data for evidence of relationships under question, and other activities. As a result, the recommendations represent the results of careful study and reflect a broadly based point of view.

In addition, steps were taken in the direction of the broader mission originally projected. Liaison was established with the Committee on Fetus and Newborn, of the American Academy of Pediatrics, and with the Public Health Conference on Records and Statistics. The Academy of Obstetrics and Gynecology was advised of the subcommittee's program; the attention of chiefs of obstetrical service in many of the teaching hospitals and medical schools was sharply focused on questions affecting the development of statistics; and early recommendations of the subcommittee were widely publicized by the National Office of Vital Statistics, Public Health Service.

There is evidence that these actions have contributed to the current increase in interest in fetal mortality. But it is clear that a need still exists for a continuing committee. Such a group, composed of representatives from the disciplines concerned, would provide a forum for the exchange of ideas on scientific, administrative, and reporting issues, and for the promotion of activities designed to reduce reproductive wastage. The investigation of the medical, biological, and environmental factors that affect this loss could thereby achieve the high position of priority it deserves.

It is thought, however, that a committee with a much broader base of sponsorship than that of the Subcommittee on Causes of Fetal Death would be required to perform these functions effectively. The appointment of a continuing committee of this type with representatives from the fields of obstetrics, pediatrics, public health, and vital statistics would be an essential step in achieving real progress in the field.

Other recommendations presented in the sections to follow are limited to specific well-defined actions which relate primarily to the improvements in data on the fetal death certificate. Many of these recommendations have already been used extensively by the national and State offices of vital statistics in revising their official certificates of fetal death. The results of 113 responses to a questionnaire sent to obstetricians in 173 hospitals in May 1952 (3) aided materially in arriving at some of these recommendations. The specific recommendations relate to:

- Medical certification of causes of fetal death on the standard form.
- Checklists for all conditions of pregnancy and labor and for methods of delivery.
- Time of death (antepartum, intrapartum) to be reported on the fetal death certificate.
- Tabulations on fetal deaths by national and State vital statistics offices.
- Suggested appointment of ad hoc committees to solve specific problems.

### Medical Certification

The medical certification section on causes of fetal death on the fetal death certificate should be revised to a sequential arrangement paral-

Figure 1. The recommended sequential arrangement of the medical certification section has been adopted in the 1955 revision of the standard certificate of fetal death (Form PHS-797). Here, parts I and II of item 22—the medical certification section—replace items 20a, “fetal causes,” and 20b, “maternal causes,” on the 1949 standard certificate.

CERTIFICATE OF FETAL DEATH <sup>1</sup>			
STATE OF _____		STATE FILE NO _____	
1. PLACE OF DELIVERY a. COUNTY _____		2. USUAL RESIDENCE OF MOTHER (Where does mother live?) a. STATE _____ b. COUNTY _____	
b. CITY (If outside corporate limits, write RURAL and give township) OR TOWN _____		c. CITY (If outside corporate limits, write RURAL and give township) OR TOWN _____	
c. FULL NAME OF (If not in hospital or institution, give street address or location) HOSPITAL OR INSTITUTION _____		d. STREET ADDRESS (If rural, give location) _____	
3. NAME OF FETUS (if given) _____		4. SEX OF FETUS MALE <input type="checkbox"/> FEMALE <input type="checkbox"/> UNDETERMINED <input type="checkbox"/>	
5a. THIS DELIVERY SINGLE <input type="checkbox"/> TWIN <input type="checkbox"/> TRIPLET <input type="checkbox"/>		5b. IF TWIN OR TRIPLET, WAS THIS FETUS DELIVERED 1ST <input type="checkbox"/> 2ND <input type="checkbox"/> 3RD <input type="checkbox"/>	
		6. DATE OF DELIVERY (Month) (Day) (Year) _____	
FATHER	7. NAME a. (First) _____ b. (Middle) _____ c. (Last) _____		8. COLOR OR RACE _____
	9. AGE (At time of delivery) _____ YEARS	10. BIRTHPLACE (State or foreign country) _____	11a. USUAL OCCUPATION _____
MOTHER	12. MAIDEN NAME a. (First) _____ b. (Middle) _____ c. (Last) _____		11b. KIND OF BUSINESS OR INDUSTRY _____
	14. AGE (At time of delivery) _____ YEARS	15. BIRTHPLACE (State or foreign country) _____	13. COLOR OF RACE _____
17. INFORMANT _____		16. PREVIOUS DELIVERIES TO MOTHER (Do NOT include this fetus) a. How many children are now living? _____ b. How many children were born alive but are now dead? _____ c. How many previous fetal deaths (fetuses born dead at any time after conception)? _____	
18a. LENGTH OF PREGNANCY COMPLETED WEEKS _____		18b. WEIGHT OF FETUS _____ LB _____ OZ	19. LEGITIMATE YES <input type="checkbox"/> NO <input type="checkbox"/>
		20. WHEN DID FETUS DIE BEFORE LABOR <input type="checkbox"/> DURING LABOR OR DELIVERY <input type="checkbox"/> UNKNOWN <input type="checkbox"/>	
		21. AUTOPSY YES <input type="checkbox"/> NO <input type="checkbox"/>	
CAUSE OF FETAL DEATH	22. I. DIRECT AND ANTECEDENT CAUSES (Enter only one cause per line) <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p><b>DIRECT CAUSE</b> State fetal or maternal condition directly causing fetal death (do not use such terms as stillbirth or prematurity). _____</p> <p><b>ANTECEDENT CAUSES</b> State fetal and/or maternal conditions, if any, giving rise to the above cause (a) stating the underlying cause last. _____</p> </div> <div style="width: 50%;"> <p>(a) _____ Due to _____</p> <p>(b) _____ Due to _____</p> <p>(c) _____</p> </div> </div>		
	II. OTHER SIGNIFICANT CONDITIONS of fetus or mother which may have contributed to fetal death, but, in so far as is known, were not related to direct cause of fetal death _____		
	I hereby certify that this delivery occurred on the date stated above and the fetus was born dead		
23a. ATTENDANT'S SIGNATURE _____ (Specify if M.D., D.O., midwife or other)		23b. DATE SIGNED _____	
23c. ATTENDANT'S ADDRESS _____		24. SIGNATURE OF AUTHORIZED OFFICIAL _____ TITLE _____	
25a. BURIAL CREMATION, REMOVAL (Specify) _____		25b. DATE _____	25c. NAME OF CEMETERY OR CREMATORY _____
		25d. LOCATION (City, town or county) _____ (State) _____	
26. FUNERAL DIRECTOR _____ ADDRESS _____		DATE REC'D BY LOCAL REG _____ REGISTRAR'S SIGNATURE _____	

<sup>1</sup> Optional heading—Certificate of Fetal Death (stillbirth)

lating the section on the death certificate. The new form should clearly indicate that conditions in both the fetus and the mother should be considered by the physician when entering cause information. Explanatory material should accompany the certificate when introducing the sequential arrangement.

The change to the recommended sequential arrangement was followed in preparing the revised standard certificate of fetal death, placed in effect January 1, 1955. Figure 1 gives the wording of the section (item 22, “Cause of Fetal

Death”) adopted by the National Office of Vital Statistics and approved by the Public Health Conference on Records and Statistics.

At the time this recommendation was under consideration, the 1949 standard certificate of fetal death was in effect. There was considerable dissatisfaction with the format of the medical certification section, which was in the form of a two-part question, one part requesting information on fetal causes, the other, on maternal causes. When entries appeared in both parts, it was uncertain which condition the physician

himself considered to be the underlying cause or how the causes were interrelated.

Another problem in attempting to utilize the fetal death record for studying causal factors was the high proportion of ill-defined causes given on the record, or no causes at all.

The change to a sequential arrangement of the certification section is viewed as an important step in overcoming the problems mentioned. One advantage of the recommended arrangement is its consistency with the certification section on the death certificate. As in the case of general mortality, the form provides a basis for determining the physician's judgment as to the underlying cause. It also increases the possibility of studying causes of fetal death as an integrated pattern, that is, the relationship of maternal to fetal causes.

The sequential arrangement was tested briefly in Johns Hopkins University Hospital and Chicago Lying-In Hospital. The participating physicians were favorably impressed by this arrangement and felt that it was more logical than the two-part form. Furthermore, the nationwide survey of many of the leading obstetricians (3) indicated that a great majority believed the sequential form provided a better basis for interpreting the cause of fetal death information than the present form.

The following guides are proposed for the use of the sequential arrangement:

1. Method of filling out medical certification section—Causes of fetal death should be recorded in part I (of item 22 on the standard form) in a sequence of pathologically or etiologically related conditions in the mother and fetus, with the injury or morbid condition which initiated the sequence of events being stated last. In part II (of item 22) should be entered any condition of the fetus or mother which may have contributed to the fetal death but, insofar as is known, was not related directly to the causes given in part I.

2. Certainty of causal relationships—A physician should enter information in part I according to the best evidence that he has available. In some cases this approach may lead to conflicting judgments, depending on the physician's background. However, at the present stage of knowledge concerning causes of fetal death, there are few positive guides that can be

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## Subcommittee on Causes of Fetal Death

United States National Committee  
on Vital and Health Statistics

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given to the physician. In view of this situation, the physician should be given full freedom in making entries rather than restricting him by a series of "don't's" on which there may not be agreement. Obviously incorrect (or impossible) statements of cause sequences that might result could be handled in the coding operation as is now being done in the case of general mortality statistics.

3. Use of certain terms—The terms "asphyxia" and "anoxia" should be acceptable as entries on the fetal death certificate. There is a possibility that their indiscriminate use may result. However, in many instances, antecedent causes standing by themselves would be considered incomplete by the physician since they would not be viewed as the cause of death. For example, it could be argued that placenta praevia would not cause the fetal death, but rather it was in the chain of events which cut off the supply of oxygen to the fetus. Recording asphyxia as the direct cause would seem more logical to the physician than banning the use



of the term. Also, asphyxia and anoxia may at times be highly informative even when they are the only causes given.

4. Entry of "unknown" as cause of fetal death—There are instances when the clinician does not know the causal factors, and "unknown" is the only honest entry that he can make. Despite the dangers inherent in making "unknown" an acceptable term, physicians should be advised that their judgment on the matter will be accepted. An official action of this type would greatly aid in gaining acceptance of the fetal death certificate.

Official agencies are urged to take the following promotional measures to improve the reporting of cause of fetal death data:

1. Development of interest at the local level, particularly among individual physicians, in fetal death statistics—The aid of State and local medical societies and maternal welfare committees should be solicited. There is a growing realization of the importance of fetal death statistics, and the climate is more suitable today for promotional activities than at any other time in the past.

2. Distribution of explanatory materials along with the new certificate—The cover used for binding books of certificates should contain instructions which will remind the physician how to fill out the sequential form.

3. Production and distribution of a film on the need for fetal death statistics on problems in reporting cause information and on methods for filling out the medical certification section—This will require a major effort and should be viewed as part of the long-range approach to dealing with the problem.

### New Supplemental Checklists

The present form of reporting "complications of pregnancy and labor" and "operations for delivery" should be replaced by checklists of "conditions present during pregnancy and labor" and "methods of delivery." Effort should be directed at obtaining reports of all conditions, both major and minor. The same checklists, except for inapplicable terms, should be placed on both the live birth and fetal death certificates in those areas that plan to use this type of item.

The checklists shown in figure 2 are suggested as guides for changing the form of the items. Provision should be made for evaluating the completeness and accuracy of information obtained on the checklists and the need for changes in the terms covered.

The change is recommended as a basis for improving the accuracy and completeness of reports on these items. For more than 10 years, medical items on complications of pregnancy and labor and operative procedures (on the 1949 standard certificate of fetal death, they appear as item 21, "State any complications of pregnancy and labor," and item 22, "State all operations for delivery") have been on the records of many States because of their potential value in dealing with modbid conditions present in the mother and child at birth (4). However, gross under-reporting and lack of uniformity in the data have appreciably reduced their usefulness (5).

Prior to the subcommittee's study of the problem, the New York State Health Department had designed a checklist form for reporting the information. Despite the hazard of having physicians omit terms that do not appear on the checklist, this approach seemed to offer a convenient and relatively simple method to help overcome present difficulties.

A great majority of the obstetricians surveyed on the matter favored a checklist form (3). This survey also elicited suggestions for changes on the New York form and established that the term "complications" in the form's heading, "Complications of Pregnancy and Labor," was being interpreted variously. Specific comments were weighed carefully in arriving at the terminology and lists given in figure 2. Decisions on important points and the reasoning behind these decisions follow:

The term "conditions" replaced "complications" to convey the idea that reports were to be made without regard to severity or physician's judgment concerning the condition's effect on the outcome of the pregnancy.

Instead of having two columns, one headed "diseases related to pregnancy" and one, "other diseases," as in the New York form, it was decided to use a single column with the heading, "conditions present during pregnancy." This single heading eliminates a point which the



**Figure 2. The supplemental checklists recommended for inclusion on live birth and fetal death certificates.**

<b>ITEMS RELATED TO PREGNANCY, LABOR, AND DELIVERY</b> (Enter one or more checks in each section)		
<b>CONDITIONS PRESENT DURING PREGNANCY</b> (Check one or more items)	<b>CONDITIONS OF LABOR</b> (Check one or more items)	<b>METHODS OF DELIVERY</b> (Check one or more items)
<div style="text-align: center; margin-bottom: 10px;"><input type="checkbox"/> NONE KNOWN</div> <div style="display: flex; flex-wrap: wrap;"> <div style="width: 50%;"> <input type="checkbox"/> PRE-ECLAMPSIA  <input type="checkbox"/> ECLAMPSIA  <input type="checkbox"/> HYPERTENSIVE DISEASE  <input type="checkbox"/> UTERINE BLEEDING, not associated with labor  <input type="checkbox"/> PYELITIS  <input type="checkbox"/> NEPHRITIS  <input type="checkbox"/> HEART DISEASE  <input type="checkbox"/> DIABETES  <input type="checkbox"/> SYPHILIS  <input type="checkbox"/> TUBERCULOSIS                         </div> <div style="width: 50%;"> <input type="checkbox"/> GERMAN MEASLES  <input type="checkbox"/> OTHER VIRAL INFECTION (specify) _____  <input type="checkbox"/> ANEMIA  <input type="checkbox"/> MALIGNANT NEOPLASMS OR RE- LATED CONDITIONS  <input type="checkbox"/> INJURY OR OPERA- TION  <input type="checkbox"/> OTHER (specify) _____                         </div> </div>	<input type="checkbox"/> Normal labor <input type="checkbox"/> Placenta praevia <input type="checkbox"/> Abruptio placentae <input type="checkbox"/> Other hemorrhage <input type="checkbox"/> Prolapse of cord <input type="checkbox"/> Breech presentation <input type="checkbox"/> Other malpresentation <input type="checkbox"/> Labor, 30 hours or more <input type="checkbox"/> Other (specify) _____ <hr/> <input type="checkbox"/> No labor <sup>1</sup>	<input type="checkbox"/> Spontaneous <input type="checkbox"/> Low forceps <input type="checkbox"/> Mid forceps <input type="checkbox"/> High forceps <input type="checkbox"/> Low cervical cesarean section <input type="checkbox"/> Classical cesarean section <input type="checkbox"/> Other cesarean section <input type="checkbox"/> Breech extraction <input type="checkbox"/> Internal version and extraction <input type="checkbox"/> Other (specify) _____ <hr/> <input type="checkbox"/> Laparotomy for ectopic <sup>1</sup> <input type="checkbox"/> Curettage, therapeutic termi- nation <sup>1</sup> <input type="checkbox"/> Curettage for incomplete termination <sup>1</sup>
<sup>1</sup> For inclusion only on fetal death certificates in areas where regulations call for reporting all fetal deaths.		
Was mother's blood tested for Rh factor?    No <input type="checkbox"/> Yes, Rh negative, sensitized <input type="checkbox"/> Yes, other <input type="checkbox"/>		
Congenital malformation?    No <input type="checkbox"/> Yes <input type="checkbox"/> If yes, describe. _____		
Birth Injury to fetus??    No <input type="checkbox"/> Yes <input type="checkbox"/> If yes, describe. _____		
<sup>2</sup> Use "infant" in place of "fetus" on live birth certificate.		

subcommittee and the obstetricians in the survey had found troublesome, that is, which conditions should be grouped together under each of the columns, "diseases related to pregnancy" and "other diseases."

Qualifications for reporting "german measles"—first trimester—and "anemia"—less than 11 grams hemoglobin—were excluded. It was agreed that, for this type of item, the vital record could not be expected to give all the qualifications. More intensive investigations would have to be based on follow-back studies using the record as the starting point. The decision about anemia was based on the result of correspondence with three outstanding hematologists who indicated that the measurement of hemoglobin level must be supplemented by other

observations in order to determine whether a pregnant woman is anemic. There is apparently no agreement on the normal range of hemoglobin in pregnancy.

The item "high forceps" appearing on the New York form was retained in the recommended checklist although this method of delivery is not considered good obstetrical procedure. A byproduct of the statistics will be to indicate how much progress has actually been made in eliminating this method of delivery.

Items on analgesia and anesthesia and induction of labor were suggested by a number of obstetricians in the survey (3) but were not included because they would have required too much amplification on the form before useful information could be derived. This decision

was consistent with the general policy of keeping the number of terms in the lists to a minimum and giving priority to those terms that could be stated in a simple, clear, and meaningful way. In line with these objectives other items such as anomaly of cord, contracted pelvis, and other dystocia were excluded.

### Time of Death

The standard certificate of fetal death, and subsequently State certificates, should include an item to determine whether the fetus died before or during labor. Use should be made of the information particularly when tabulating cause of fetal death data.

Such an item, which now appears as item 20 on the 1955 revised standard certificate (fig. 1), was also a part of the standard certificate until 1949, when the item was dropped because of an apparent lack of interest.

However, there are now definite indications that distinguishing between fetal deaths that occur before labor and during labor or delivery would greatly aid in understanding causal factors. Statistics tabulated by one of the States demonstrated the marked difference between the two groups in the distribution of causes of death. For example, placental and cord conditions were given as causes for a third of the fetal deaths that occurred "before labor" as compared with similar statements for more than half of the "during labor" group. Also, diseases and conditions of pregnancy and childbirth ranked second in groups of causes of fetal death in the antepartum period but were reported for very few of the intrapartum fetal deaths.

More extensive tabulations of this type and those which take into account such characteristics as age of mother, birth order, and period of gestation would be a great aid to medical research and public health programs.

### Tabulations on Fetal Deaths

National and State offices of vital statistics should be encouraged to prepare:

1. Comparable tabulations on fetal deaths and live births in order to facilitate computation of

fetal death rates—Attention should be given to comparability in definitions.

A review of published and unpublished data showed that some of the tabulations of fetal deaths did not parallel the detail on live births. This has created problems for the research worker who wishes to compute rates. The tabulation of data on birth order (excluding fetal deaths) for live births and birth order (including fetal deaths) for fetal deaths was cited as a confusing practice. To compute fetal death rates by birth order, data should be available for both live births and fetal deaths on an "including fetal deaths" basis.

2. Experimental tabulations comparing the distribution of cause of death data for early neonatal deaths with cause data for late fetal deaths—For the purpose of this comparison, the term "early neonatal" refers to deaths occurring during the first week after birth, and "late" fetal deaths refer to those of gestations of 28 weeks or more—group III in the international recommendations (2).

For the present, the major purpose of these experimental tabulations is to develop a body of data which will clarify the difficulties in comparing causes being certified for fetal deaths and deaths in early infancy. With time, as the reported data improve and coding problems are resolved, the statistics can be studied for evidence of a continuum of conditions affecting the outcome of the pregnancy.

3. Tabulations of causes of fetal death on a multiple-cause basis—In view of the relatively small volume of records involved, preparing multiple-cause tabulations should not prove to be too heavy a burden. Single-cause tabulations would not be highly productive at this stage when so little is known about the causal relationships.

The function of statistics on causes of fetal death is, broadly, to provide information that will be useful in the prevention of fetal loss. Prevention may take the form of an immediate program which requires data on conditions whose etiology is clearly and uniformly understood, or its beginning may be found in slowly evolving research which utilizes data for causal factors whose preventability or etiology may not be known. Single-cause tabulations would not be highly productive for the latter purpose,

which is the more important of the two today. Instead, attention should be focused on multiple-cause tabulations.

No recommendations have been made on the items to be studied in relation to the causes recorded. But it would be desirable to initiate experimental tabulations which relate causes to other medical information and to biological factors such as birth order and age of mother.

### Ad Hoc Committees

A number of problems associated with the classification and reporting of causes of fetal deaths and diseases of early infancy emerged in the course of the subcommittee's deliberations. It is recommended that ad hoc committees be appointed to study these problems. Among the problems which were specifically mentioned are:

1. Changes in the Y-code (causes of fetal death code) of the International Classification of Diseases, Injuries, and Causes of Death—Although the Y-code as it now stands appears to be adequate for most purposes, there is a need for reviewing the code principally to see whether any of the causes given in the "ill-defined" category should be treated separately and whether any combinations of causes, as in the case of Y-37, "birth injury," should be provided.

2. Recording of maternal conditions as causes of early neonatal deaths—Where applicable, maternal conditions should be reflected in the medical certification of causes of death for infants who die shortly after birth. However, the physician who fills out the death certificate usually does not have available to him information concerning maternal conditions that may have caused the death. One of the questions needing consideration is how to deal with this issue, which fundamentally requires bridging the gap between the obstetrician and the pediatrician.

There are other practical sides to the issue. For example, a physician who has all of the information concerning the pregnancy may still have to make a choice between a maternal condition whose etiology is not too well known and a condition found in the infant that has a specific meaning for him. Obstetrical and pedi-

atric case histories would undoubtedly clarify the practical problems that would face a physician in applying the principle that appears to be acceptable at this point.

A related question which needs consideration concerns the reconciling of the Y-code (causes of fetal death code) and the "700" rubrics (deaths in early infancy) of the international statistical classification. At the present time the "700" rubrics do not classify maternal conditions that would appear in the medical certification section if the above program were successful.

3. Development of a list of causes of fetal death for physician use—A number of respondents in the survey (3) of obstetricians suggested that physicians be furnished a list of acceptable terms to use in entering causes of fetal death. Proponents argue that such a list could be brief, containing basically just those terms which are needed for classification purposes. The counter position is that the list is really a nomenclature which would be difficult to reduce to a manageable set of terms. It is also contended that if the nomenclature and classification listings were viewed as interchangeable the result would be to confuse the physician and either force him into a narrow pattern of reporting terms or cause a breakdown in the reporting.

### REFERENCES

- (1) Yerushalmy, J., and Bierman, J. M.: Major problems in fetal mortality. In *Vital Statistics—Special Reports*, vol. 33, No. 13. Washington, D. C., U. S. National Office of Vital Statistics, 1952.
- (2) U. S. National Office of Vital Statistics: International recommendations on definitions of live birth and fetal death. Public Health Service Publication No. 39. Washington, D. C., U. S. Government Printing Office, 1950.
- (3) Potter, E. L., and Shapiro, S.: Survey of opinions of obstetricians concerning official reporting of fetal mortality. *Am. J. Obst. & Gynec.* 67: 651-660, March 1954.
- (4) Connecticut State Department of Health: Report of study of complications shown on birth certificate supplement. *Conn. State Med. J.* 15: 148-152, February 1951.
- (5) Lillienfeld, A. M., Parkhurst, E., Patton, R., and Schlesinger, E. R.: Accuracy of supplemental medical information on birth certificates. *Pub. Health Rep.* 66: 191-198, Feb. 16, 1951.



# The Eighth World Health Assembly

By CHARLES W. MAYO, M.D., and FREDERICK J. BRADY, M.D.

**T**HE Eighth World Health Assembly met in Mexico from May 10 to May 27, 1955. As in past years, the United States delegation to this annual meeting of the member countries of the World Health Organization included officials of government and voluntary and professional health organizations.

Earlier assemblies have reflected the growing importance of the World Health Organization in cooperative international efforts to improve man's health. These assemblies have authorized activities which already are proving surprisingly beneficial: technical assistance to fight malaria and other communicable diseases and to build national health services; worldwide services, such as epidemiological reporting; and mobilization of expert health knowledge in expert committees and seminars. The Eighth World Health Assembly, the first assembly to be held in the Western Hemisphere, made decisions which highlight the value of the work started by the 1946 International Health Conference in New York City where the WHO constitution was drafted.

## Atomic Energy

By its constitution, the World Health Organization is established as the coordinating authority on international health work. The Eighth World Health Assembly prepared the way for active participation of WHO in the development of the uses of atomic energy for the purposes of health. It approved plans resulting from careful work done by the secre-

tariat, by the experts on the WHO Executive Board, and by a special consultant group called by WHO in December 1954. The assembly granted the Director-General's request for funds to employ an expert in radioisotopes and to establish a new Expert Committee on Atomic Energy in Relation to Public Health. WHO is expected to take on major responsibilities in sponsoring exchange of information, in training in health protection of those working with, or in the vicinity of, radioactive materials, and in the diagnostic and therapeutic uses of radioisotopes. This authorization of WHO responsibility in the health aspects of atomic energy, parallel to that already authorized in other health fields, indicates the recognition by member governments of the usefulness and potentialities of WHO.

## Malaria Eradication

The Eighth World Health Assembly took action also to help put an eventual end to an ancient problem. Malaria, the single most serious worldwide communicable disease, continues to devitalize some 350 million people each year. The governments represented at the assembly voted to shift emphasis forthwith from malaria control to malaria eradication. In recent years, use of DDT and other new insecticides has proved eradication feasible, usually at a cost far below that exacted by halfway measures, which are not fully effective, permit the disease to persist, and require constantly recurring expenditures. The development of mosquito re-

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## United States Delegation

*Chief delegate:* Dr. Charles W. Mayo, chairman, Mayo Association, Mayo Clinic, Rochester, Minn.

*Delegate:* Dr. Frederick J. Brady, assistant chief, Division of International Health, Public Health Service.

*Alternates:* Dr. LeRoy E. Burney, deputy chief, Bureau of State Services, Public Health Service; Howard B. Calderwood, Office of International Economic and Social Affairs, Department of State; Dr. Martha Eliot, chief, Children's Bureau, Department of Health, Education, and Welfare.

*Congressional advisers:* The Honorable William H. Avery and the Honorable Thomas E. Morgan, House of Representatives.

*Advisers:* Dr. Otto Brandhorst, chairman, American Dental Association, St. Louis, Mo.; Dr. A. W. Dent, president, Dillard University, New Orleans, La.; Dr. Harold S. Diehl, dean, University of Minnesota Medical School, Minneapolis, Minn.; Dr. David French, Office of International Administration, Department of State; Dr. William R. Norton, State health officer, Raleigh, N. C.; Miss Agnes Ohlson, president, American Nurses Association, New York, N. Y.; Dr. Arthur S. Osborne, international health representative, Division of International Health, Public Health Service; Dr. Calvin B. Spencer, chief, Division of Foreign Quarantine, Bureau of Medical Services, Public Health Service; Capt. Robert I. Ware, executive officer, Naval Medical School, National Naval Medical Center, Bethesda, Md.; Dr. Charles L. Williams, Jr., chief, Latin American Branch, Public Health Division, International Cooperation Administration; Mrs. Nell Hodgson Woodruff, Atlanta, Ga.

## WHO Executive Board

*Representative:* Dr. H. van Zile Hyde, chairman, chief of the Division of International Health, Public Health Service.

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sistance to DDT in some parts of the world suggests there is no time to be lost in eradicating the parasite while it is still possible to control the vector with chlorinated hydrocarbon insecticides. The assembly therefore authorized WHO to place special emphasis on stimulating national governments to intensify malaria eradication programs. This decision by the countries of the world means that many malarious areas, with encouragement and assistance from international agencies like WHO and UNICEF, and from bilateral agencies like our International Cooperation Administration, may

free themselves of malaria within the next 10 to 15 years.

As do other WHO programs of technical assistance, malaria eradication abroad has far-reaching implications for our country and for the possibilities of world peace, since it improves conditions of life, morale, and economic productivity of men and women in malarious lands. Thus, the WHO and ICA technical assistance programs are complementary and share many common objectives. The existence of an international health agency, in which nearly all countries of the free world cooperate, has made it possible for countries to join in a common decision to eradicate malaria.

## Poliomyelitis

Recent events have dramatized the serious aspects of poliomyelitis. The assembly made a special appropriation to permit WHO to expand its program in poliomyelitis control. This work of coordinating laboratory research and training and strain identification in many countries is an instance of how WHO stimulates and guides worldwide health services. The United States delegation reported to the assembly on the latest Salk vaccine developments in the United States. Other countries, including Canada and Denmark, also presented information on their Salk vaccine programs.

## International Quarantine

Another worldwide WHO activity, one which has received great attention and wide support from governments, is the administration of the International Sanitary (Quarantine) Regulations. These regulations, which promote uniformity in quarantine procedures to combine maximum protection against disease with minimum interference with trade and travel, were amended along lines proposed by the United States in order to meet more effectively the requirements of member governments.

## Second General Program of Work

In addition to acting on specific program activities, the Eighth World Health Assembly also laid down the general objectives, methods,



President Eisenhower welcomes the WHO visitors on the White House lawn. On the President's left is Surgeon General Leonard A. Scheele and on his right is Dr. Chester Keefer.

and categories of WHO programs for forthcoming years through 1960 by endorsing the second general program of work substantially as drawn up by the executive board. This program underlines the aims of strengthening national health services, training personnel, and

of controlling, or eradicating when feasible, major communicable diseases. It places increased emphasis on the planning and development of health as an integral part of economic and social development and on WHO's role of coordination among organizations engaged in

international health work. No basic changes are made in the lines along which WHO is developing, an indication of general satisfaction on the part of governments with WHO activities.

## Scale of Assessments

The assembly undertook a drastic revision of the scale by which the contributions of members are assessed, the first such revision since the establishment of WHO in 1948. One aspect of the revision is that the percentage of the United States assessment will, over a 4-year period (1956-59), be reduced to a level where it is no more than one-third of the total assessment against active members only. This decision is important to the United States so long as some countries continue to be assessed but are inactive and make no payments. While the United States delegation urged full reduction in the United States percentage immediately, many members could not support a rapid corresponding increase in the assessments of other nations. Following the assembly, Congress removed the ceiling of \$3 million on the authorization for the annual United States contribution to WHO. The recent announcement by the U.S.S.R. of intentions to resume active membership in WHO may accelerate the adjustment of the scale of assessments.

## Budget for 1956

The Director-General had proposed a budget for 1956 which would involve substantially the

same amount of assessments against members as in 1955. The payment to WHO of a large number of contributions for previous years resulted in an unexpected increase in available funds and made it possible to provide a higher expenditure level without a proportionate increase in assessments. The assembly voted a total effective working budget of \$10,203,084, including several additional items (\$42,000 for atomic energy, \$309,500 additional for malaria eradication, and an additional \$240,000 for costs of technical personnel on joint projects with UNICEF). The assessment against the United States for 1956 will be about \$3,410,000, an increase of about \$60,000 over that for 1955.

## The Value of WHO

We have long believed that the World Health Organization is rightly taking the lead in the international effort to help man remove a burden of ill health that is no longer inevitable or tolerable. It is an effort that is both humanitarian and imperatively realistic. By the same token, WHO is one of the foremost agencies of the United Nations family which is working to build peaceful conditions of life. WHO was fashioned primarily by leaders in the medical and public health professions. It is a technical agency which receives wide support from the people and the governments of the world. Humanity can be proud that this organization continues to develop along lines which are influential and sound, and fosters both public health and goodwill among nations.

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# Post-Assembly Technical Sessions

FOLLOWING the Eighth World Health Assembly held in University City, Mexico, a series of seminars for assembly delegates was conducted in the United States under the general title "Post-Assembly Technical Sessions."

The National Citizens Committee for the World Health Organization sponsored these sessions and invited the delegates. In response, some 146 guests, 40 ministers or directors of health (current or emeritus), and other top health officials from 50 countries visited the United States and attended part or all of the discussions held from May 30 through June 4, 1955. Foreign students receiving medical and public health training in the United States were also among the group.

The seminars included roundtable discussions by 80 physicians, scientists, and administrators (including 3 from other countries—India, Yugoslavia, and Denmark). Questions raised by the visitors were subjects of general discussion.

Fifty private organizations and firms assisted in staging and presenting the seminars; in particular, various drug manufacturing firms gave financial assistance.

President Eisenhower welcomed the visitors to Washington. The President referred to WHO as one of the principal arms of the United Nations and praised WHO campaigns to improve the health of the people of the world. The delegates also were greeted by Dr. Fred L. Soper, director of the Pan American Sanitary Bureau (WHO Regional Office for the Americas) and three officials of the Department of Health, Education, and Welfare—Dr. Chester Keefer, at that time special assistant to the Secretary for medical affairs; Surgeon

General Leonard A. Scheele of the Public Health Service; and Dr. Martha Eliot, chief of the Children's Bureau. The National Institutes of Health and the Division of International Health of the Public Health Service assisted the Department and the National Citizens Committee in organizing the Washington seminars.

Moving on to Baltimore, the visitors were welcomed by Dr. Lowell Reed, president of the Johns Hopkins University, and by the faculty of the School of Hygiene and Public Health, and then participated in seminars at the Johns Hopkins University.

The program in New York City included greetings from Dr. Victor Belaunde, then President of the United Nations Security Council; Philippe de Seynes, Under Secretary of the United Nations for Economic and Social Affairs; Dr. Thomas Parran, president of the National Citizens Committee for WHO, and the commissioners of health for New York State and New York City, Dr. Herman Hilleboe (p. 1069) and Dr. Leona Baumgartner.

After the post-assembly technical sessions, some of the visiting health officials attended the scientific assembly of the American Medical Association in Atlantic City.

The following pages contain summaries of some of the seminars. Marked by a cordiality characteristic of the World Health Assembly, the discussions sought to inform health officials of other countries about public health programs and principles in the United States and thus increase their understanding of them and of the importance of United States participation in the World Health Organization.



# Design and Construction Of Hospital Facilities

The coordinated and integrated hospital system now developing in this country makes hospital services more accessible and provides better quality care, Dr. Cronin said. Although the hospital bed deficit in 1946 was 900,000, and each year more hospitals become physically or functionally obsolete, notable progress has been made toward providing adequate hospital services in all areas of the country.

Cronin said that there are three kinds of hospitals in this country—governmental, voluntary nonprofit, and proprietary. Exclusive of those operated by Federal agencies, there are approximately 7,000 hospitals in the United States.

A study made in 1942 by the United States Department of Agriculture showed a severe shortage of physicians in rural areas and, further, that 3,100 counties had no hospital services whatsoever.

The Hospital Facilities Survey and Construction Act, passed by Congress in 1946, provided funds to the States for planning and building hospitals and related facilities. Under this law, the Federal Government sets minimum building standards, gives technical assistance, and apportions the available funds to the States on the basis of need. The States are responsible for the use of funds, on a matching basis, by suitable project sponsors in areas with high priority of need. Each State has established a

hospital advisory council, with professional and consumer members. It has developed its own hospital service areas on the basis of population and availability of health services, and since 1948, has apportioned its share of Federal funds.

The basic act provided that Federal funds could not be used to build in excess of statewide ratios of 4.5 general hospital beds per 1,000 population, 5 mental beds per 1,000 population, and 2 chronic disease beds and about 1 tuberculosis bed per 1,000 population. One health center is planned for every 30,000 to 50,000 population, depending upon density of population and certain geographic factors.

Since 1948, \$600 million of Federal funds and \$1,340 million of local and State funds have been committed for 2,500 projects and about 540 health centers which, when completed, will provide 117,000 beds. At this time about 400 health centers and 1,800 hospitals, providing 84,000 beds, are completed and in operation. Of the health centers, 75 were built in conjunction with hospitals, contributing to health maintenance both by preventive and curative types of programs.

Fifty-eight percent of the hospitals have less than 50 beds and are located in towns with less than 5,000 population. They have been built in 700 towns which previously had no acceptable hospital facilities. These hospitals are of infinite value in emergencies. Federal funds have also helped build or improve 30 teaching hospitals at universities and medical schools in 18 States, thus helping to alleviate the shortage of professional personnel in the smaller hospitals.

The program is helping to get physicians and other professional persons to locate in smaller communities. Georgia estimates that 60 physicians have been attracted to the newly opened hospitals. A survey shows that 2 out of 5 registered nurses on duty in the new hospitals came out of retirement to practice in their home areas.

New problems arise, Cronin said, as our life expectancy increases. Although the American population has doubled in the first half of this century, our population over 65 years old has quadrupled, and this trend is expected to con-

**Discussion Leader:** John W. Cronin, M.D., chief, PHS Division of Hospital and Medical Facilities.

**Discussion Panel:** Edward T. Thompson, M.D., chief, Operations Branch, PHS Division of Hospital and Medical Facilities; August F. Hoenack, acting chief, Architectural and Engineering Branch, PHS Division of Hospital and Medical Facilities.

**Rapporteur:** Jean Allen, information specialist, PHS Division of Hospital and Medical Facilities.

tinue. Patients with chronic diseases now occupy about 25 percent of all hospital beds. The cost for care in general hospitals is more than double that in chronic disease hospitals, thus imposing a heavy burden on long-term patients.

With these problems in mind, Congress in 1954 amended the Hospital Facilities and Construction Act and increased the authorization of funds to include the building of nursing homes and rehabilitation, diagnostic, and treatment centers, and to give added emphasis to the building of chronic disease hospitals. This action should result in a worthwhile contribution to facilities for our aging population.

Mr. Hoenack said that at the beginning of this program there was very little knowledge concerning the design and equipment of hospitals. Through the cooperation of the American Hospital Association, the American Institute of Architects, the Public Health Service, and various schools and manufacturers, helpful guide materials have been developed. Programs must be fully developed before hospitals are built, and all guide materials must be adapted for local use after study of local needs. The chief technical problems of the program have centered around the necessity for educating both designers and users of hospitals.

Dr. Thompson said the program has contributed to better patient care because the facilities operate under State licensing laws and because the majority of them have been accredited by the American College of Surgeons. There are no Federal regulations covering the operation of hospitals.

In reply to a question, Cronin stated the Federal Government funds are used to pay part of the cost of building and equipping hospitals, but Federal funds are not available for their operation. The average building cost of a general hospital bed is now \$16,000. A university teaching hospital may cost as much as \$30,000 per bed to build.

It is difficult to state the most economical size for a general hospital. Those with more than 200 beds are very expensive to operate because of the variety of services provided. Those between 50 and 100 beds are more economical but

cannot give the specialized treatments found in larger facilities.

Project sponsors must give assurance that they have access to funds to defray an anticipated 2-year operating deficit. Hospitals built under this program must be operated by an eligible sponsor for a period of 20 years.

The State agencies determine the percentage of Federal funds to be awarded projects within their boundaries as well as the priority status of the projects.

## Advances in Virology And Parasitology

Dr. Rowe discussed the recent advances in the studies of viruses in tissue culture. The use of tissue culture techniques, stimulated by the discovery by Enders and his co-workers of the cytopathogenicity of poliomyelitis viruses for tissue cultures of human cells, has revolutionized the field of virology. Noteworthy advances brought about by these techniques have been the isolation of the virus of rubeola by Enders, of varicella and herpes zoster by Weller, of the mouse and possibly the human salivary gland viruses by Smith, the virus of an epidemic exanthematous disease by Neva and Enders, and the viruses of canine infectious hepatitis and vesicular exanthema of swine.

The discovery of the adenoidal-pharyngeal-conjunctival (APC) viruses was also made

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**Discussion Leader:** Willard H. Wright, Ph.D., chief, Laboratory of Tropical Diseases, National Microbiological Institute, National Institutes of Health, Public Health Service.

**Discussion Panel:** Wallace P. Rowe, Ph.D., virologist, NIH Laboratory of Infectious Diseases; Leon Jacobs, Ph.D., parasitologist, NIH Laboratory of Tropical Diseases.

**Rapporteur:** Paul Weinstein, Sc.D., parasitologist, NIH Laboratory of Tropical Diseases.

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possible by tissue culture techniques. Following the original isolation of these viruses from spontaneously degenerating cultures of human adenoids and tonsils, various members of the group have been found in association with acute respiratory infections. Type 3 has been shown to be the cause of a new clinical entity, pharyngoconjunctival fever; type 4 (RI-67 strain of Hilleman and Werner) and type 7 (Gomen strain of Trygve Berge) have been found to be the cause of a number of febrile respiratory infections in military recruit personnel. The types most frequently recovered from adenoids and tonsils, types 1, 2, and 5, have also been isolated from sporadic cases of acute febrile pharyngitis.

Tissue culture techniques have also been of value in the study of influenza viruses. Following the report of Mogabgab that field strains of influenza viruses are cytopathogenic for monkey kidney tissue cultures, workers at the National Institutes of Health have shown that this procedure is much more highly sensitive than use of embryonated eggs for the isolation of the 1955 strain of influenza B.

Dr. Jacobs, speaking on the newer knowledge of parasitic diseases, discussed primarily the manifestations of human toxoplasmosis. He reviewed acute congenital and acquired disease syndromes and considered in some detail chronic toxoplasmosis of the eye. The opinion was presented that ocular toxoplasmosis of adults may be the most significant manifestation of the infection. This was based on the findings by Wilder in 1952 of parasites resembling *Toxoplasma* in some 50 human eyes enucleated because of chorioretinitis. Serologic tests on 22 of these subjects were all positive at low titer. Also, a correlation was found between chorioretinitis and the presence of *Toxoplasma* antibodies even though here again the antibodies were mostly at low titer. The low antibody levels could be explained on the basis of the persistence of parasites in neural tissue remote from the sites of antibody formation. Final demonstration that this persistence could occur was obtained by the isolation of *Toxoplasma* from the eye of a 30-year-old man with a history

of recurrent chorioretinitis of 8.5 years duration and only low antibody levels in the serum.

Knowledge of the epidemiology was given, indicating that the infection is most prevalent in warm, moist areas rather than in cold or hot, dry ones.

The antimalarial drug pyrimethamine was found by Eyles to act synergistically with sulfadiazine against proliferating, but not encysted, forms of *Toxoplasma*. Use of these drugs in presumed cases of adult ocular toxoplasmosis has given encouraging results at the Clinical Center of the National Institutes of Health.

## New Developments In Insecticides

Mr. Henderson opened his remarks on the area application of insecticides by stating that the use of chlorinated hydrocarbon insecticides such as DDT has controlled or eradicated arthropod-borne diseases in many areas of the world. Although malaria primarily is a rural disease, control formerly was confined chiefly to urban and suburban communities. Sanitation measures, such as building drains, were relied upon for control of malaria. There was little need for a comprehensive operation team to plan and manage these operations at that time.

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**Discussion Leader:** Justin M. Andrews, Sc.D., associate chief for program, Bureau of State Services, Public Health Service.

**Discussion Panel:** Winton B. Rankin, M.S., assistant to the commissioner, Food and Drug Administration; Herbert L. Haller, Ph.D., assistant director, Crops Research, Agricultural Research Service, Department of Agriculture; William F. Durham, Ph.D., biochemist, Toxicology Section, PHS Communicable Disease Center; John M. Henderson, M.S., deputy chief, Technical Development Laboratories, PHS Communicable Disease Center.

**Rapporteur:** Donald R. Johnson, M.S., entomologist, PHS Division of International Health.

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Malaria control or eradication now is "big business," and the basic principles of organization and management must be followed in order to attain success. Delegation of authority is one of these basic principles. This applies not only to the delegation of authority from the leader of the program within progressively narrowing bounds down to the individual spray crews, but also to procurement of supplies and obtaining statistical data.

An adequate staff must be chosen to administer the program properly. This staff should consist of medical, entomological, and engineering professional personnel who will work together, using all of their combined skills as a malaria control team. The key person is the team leader, who must fuse the staff functions into a common program as well as obtain the necessary financial support.

Resistance to insecticides now must be considered when developing these programs. The development of mosquito resistance to insecticides is a product of selection pressure, duration of that pressure, and the genetics of the species involved. In regard to *Anopheles* mosquitoes, out of the some 50 significant malaria vectors throughout the world, only 4 or 5 have demonstrated development of resistance. The following are solutions to the resistance problem:

1. The eradication of the disease or the mosquito species.

2. Annual shifting to other insecticides. This is complicated by cross resistance such as occurs in the use of chlorinated hydrocarbon insecticides.

3. Development of new insecticides against which resistance will not develop as rapidly as with the presently used insecticides.

4. Judicious application of insecticides. Larviciding with an insecticide of the same group of material used as an adulticide should be avoided. Adulticiding alone is preferable because larviciding exerts more selective pressure than adulticiding.

It may be desirable to reduce the frequency of insecticidal application and to choose an insecticide with a shorter residual duration. Such material should be applied immediately prior to the malaria season. Baselines should

be established in areas where resistance among anophelines has not become apparent in order that we will be able to recognize resistance when it starts.

Dr. Haller talked on the chemical constitution of the new insecticides, which, he said, are among the most important weapons of public health workers. With the aid of the newer insecticides, large international responsibilities in public health have been undertaken. As a result, the worldwide gains made against typhus, dysentery, yellow fever, and malaria are becoming more pronounced. The newer insecticides that have attracted greatest attention may be divided into four broad classes—chlorinated hydrocarbons, organic phosphorus compounds, chemicals that are especially useful with pyrethrum (the so-called synergists), and synthetic pyrethrin-like esters, almost identical in composition with the insecticidal principles in natural pyrethrum. Pyrethrum and the synthetic esters exert a rapid paralytic action (knockdown) on insects, a factor especially important in controlling disease-carrying insects.

Some of the recent developments in insecticide toxicology were brought out by Dr. Durham. During the last 2 or 3 years organic phosphorus compounds have come into general use as insecticides. Malathion, chlorthion, dip-terex, and diazinon are noteworthy because they are considerably less toxic than some of the other phosphates being used. Demeton ranks rather high in its oral toxicity to rats but has certain insecticidal advantages by virtue of its systemic effect.

The major pharmacological action of the organic phosphate compounds is their ability to inhibit the enzyme cholinesterase, with a resultant increase of unhydrolyzed acetylcholine leading to signs and symptoms referable to overstimulation of the parasympathetic nervous system.

One sequel of organic phosphorus intoxication is peculiar to certain of these compounds. This is a neurotoxic effect resulting in "jake-leg paralysis." The serious and essentially irreversible nature of this paralytic syndrome makes it desirable to screen the various insecticides of this group for their ability to cause such

paralysis. Chickens appear to be the best available index of a possible paralytic effect in man. The test consists of subcutaneous dosing of atropinized chickens. None of the organic phosphorus insecticides now in general use produced delayed effects corresponding to jake-leg paralysis.

A distinct and different syndrome appeared in hens dosed with malathion and EPN. They developed leg weakness immediately after dosing in addition to the more usual cholinergic symptoms. Although this is not to be interpreted as an indication that a similar effect in man will result from exposure to these compounds by the more usual routes, it is reason for exercising appropriate safety precautions.

When comparing the hazard of dermal versus respiratory exposure to these compounds applied as sprays, it has been indicated that the dermal route is much more important than the respiratory route.

The effect of daily oral doses as high as 35 mg. of DDT daily on man has been extensively studied. Over a 1-year period, no adverse effects attributable to DDT intoxication have been noted. Dieldrin and endrin, respectively, appear to be about one-fourth and six times as toxic to rats as DDT.

Although there have been a few cases of dieldrin toxicity to spraymen, all those affected recovered. No known toxicity to occupants of houses sprayed with the most commonly used chlorinated hydrocarbons (DDT, dieldrin, BHC) has been reported, and the benefits derived from these materials greatly outweigh the toxic hazards.

In discussing tolerances for insecticide residues on food, Mr. Rankin stated that in 1952, the Food Protection Committee, Food and Nutrition Board, National Research Council, published its "Basic Considerations Involved in Evaluating Hazards Encountered in the Use of Pesticides on Foods," which contains guiding principles for judging the safety of insecticides and other pesticides. In 1954, many of these basic principles were incorporated in a new law, the pesticide chemicals amendment to the Federal Food, Drug, and Cosmetic Act (Public Law 518, 83d Cong.). This law pro-

vides a practical method for establishing safe tolerances for residues of pesticide chemicals in certain foods. (Insecticides are one form of pesticide chemicals.) The law prohibits the marketing of food if it bears a residue of a pesticide chemical, unless:

1. The chemical generally is recognized by experts as safe, or
2. Upon consideration of an adequate amount of scientific evidence, the Government has established a safe tolerance for residues of the chemical or has exempted it from the requirement of a tolerance, and
3. If a tolerance has been established, the residues remaining on the food are within the safe tolerance level.

The petitioner who requests the establishment of a tolerance for insecticide or pesticide residues or an exemption from the requirement of a tolerance must submit data to the Government to support his application. Data required in a petition are:

1. The name, chemical identity, and composition of the pesticide chemical.
2. The amount, frequency, and time of application of the pesticide chemical.
3. Full reports of investigations made with respect to the safety of the pesticide chemical.
4. The results of tests on the amount of residue remaining, including a description of the analytical methods used.
5. Practicable methods for removing residue which exceeds any proposed tolerance.
6. Proposed tolerances for the pesticide chemical if tolerances are proposed.
7. Reasonable grounds in support of the petition.

The establishment of tolerances under this new law is only a part of a broader problem, the addition of poisonous or deleterious substances to any food. The Federal Food, Drug, and Cosmetic Act provides a different method for establishing tolerances for poisons which are not pesticide chemicals. Although the method is different, the general principles are the same. The chemical identity of the poisonous substance should be established; the acute and chronic pharmacological properties should be well investigated; there should be trust-

worthy analytical methods for determining the quantities which remain in food; the tolerance should involve an ample margin of safety; and allowance must be made for cumulative effect of the same substances from different sources or of related substances.

## Collection and Use Of Statistics

Dr. Dunn, opening the discussion, stressed that statistics help answer the practical questions involved in making program decisions. Health administrators can use statistics to (a) identify and measure the extent of public health problems; (b) plan, conduct, evaluate, and promote public health programs; (c) guide the geographic allocation of health facilities and resources; and (d) provide suggested benchmark information needed in epidemiology and in many types of medical research.

In this country, health programs use seven types of statistics. Four of these are essentially repetitive and routinized. They include census data, vital statistics, notifiable disease reports, and the massive reporting of statistics by institutions, particularly the mental institutions. The generally nonrepetitive types include special surveys, research and laboratory statistics,

and service statistics (a large part of which may be repetitive).

Dr. Moriyama said that, in the United States, vital statistics consist of data derived from the legal records of live birth, fetal death, death, marriage, and divorce. They also include data on notifiable diseases reported by physicians. Legal authority and responsibility for registration and permanent filing of the records rest in the individual States. Uniformity of basic items and coordination of registration and statistical activities are achieved through joint planning with the National Office of Vital Statistics of the Public Health Service.

In addition to supplying routine vital statistics, he said, the death certificate is used as a starting point in following back to the attending physician or informant for other data, thus serving as the basis for special studies of specific diseases. Vital statistics data have been used for special analytical studies of tuberculosis, cancer, cardiovascular-renal diseases, multiple sclerosis, and motor-vehicle and home accidents.

Statistics of live births and fetal deaths are also widely used for public health purposes. Certificates now contain information on birth weight, which is useful in coping with premature birth problems. Data are also available on complications of pregnancy and labor and on congenital malformations of the live-born child. Moriyama stated that this information is used for followup by local health departments.

Dr. Dauer stated that on the basis of reports from physicians and institutional authorities the State health departments send weekly telegraphic summaries to the Public Health Service. These data, which show the number of reported cases of each of 20 diseases, are published and distributed to international, Federal, State, and local health agencies, and to the press. The data dissemination is rapid, he said, so they may be used effectively. Telegraphic reports are made at once when any of the 6 quarantinable diseases occur. The States also furnish annual figures for 40 diseases.

Dauer explained that for disease control, and other purposes, a system of reporting epidemics or unusual occurrences of diseases has been de-

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**Discussion Leader:** Halbert L. Dunn, M.D., chief, National Office of Vital Statistics, Public Health Service.

**Discussion Panel:** Iwao M. Moriyama, Ph.D., chief, Mortality Analysis, PHS National Office of Vital Statistics; Carl C. Dauer, M.D., medical adviser, PHS National Office of Vital Statistics; C. A. Smith, M.D., chief, Venereal Disease Program, PHS Bureau of State Services; Theodore D. Woolsey, biostatistician, PHS Division of Public Health Methods.

**Rapporteur:** Mort Gilbert, publications officer, PHS National Office of Vital Statistics.

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veloped. State health officers are requested to report epidemiological investigations when a disease occurs in unusual circumstances.

Dr. Smith, discussing the national venereal disease control program, stated all sources of data so far discussed in this meeting have been drawn upon. In addition, specialized morbidity reporting and service statistics have been developed. The reports provided the knowledge upon which the control program was based.

Smith said experience showed that it was no longer profitable to direct case-finding surveys to large, unselected segments of the population. By refined survey activities, significant correlations were found between rates of infection and the usual measures of low social status—poor housing, overcrowding, incomplete education, and low income. Files of reported cases and spot maps pinpoint the problem locally and guide the case-finding team to communities and population segments most likely to be productive.

Blood testing, he said, is an excellent means of finding cases of latent syphilis, but to break the chains of infections the most satisfactory mechanism is interviewing and followup of contacts.

Therapy evaluation is also an integral part of the program, Smith emphasized. Knowledge of the effectiveness of intensive arsenotherapy schedules was the basis for the rapid treatment center program of World War II. These statistical techniques were adapted to the evaluation of penicillin, so that the time-dosage relationship and optimum amounts of penicillin therapy were quickly established. The proved efficacy of the long-acting types, he said, made it possible to return the treatment of syphilis to the outpatient clinic and the private physician.

Thus, statistics are more than a tool or service in a communicable disease program. They are an integral part of program planning, operations, and evaluation.

Mr. Woolsey defined a population survey in health statistics as any technique by which health information is collected from a sample of the population.

Sample surveys, he stated, are suitable for collecting various types of health statistics, such as incidence and prevalence of current illness, particularly chronic diseases; days lost from work; prevalence of impairments, such as blindness and deafness; availability of medical care; coverage of medical care insurance; attitudes; and sanitation, housing, and other environmental aspects.

Such statistics serve many uses in the administration and evaluation of public health programs, for example, in ranking health problems, estimating scope and cost of new programs, and in following cohorts of individuals to evaluate disease prevention and therapy. They are used to estimate needs for medical facilities, for rehabilitation services, and for drug preparations and appliances. Frequently, they suggest hypotheses to be tested by medical research.

Woolsey said the household survey approach has many advantages. Social, economic, and environmental data can be obtained; one can work outward from the interview to the patient's medical records; greater flexibility permits questions to be adapted to current needs.

On the other hand, he noted, household surveys are expensive and require technical skills that are uneconomical for small health departments to maintain on a staff basis.

Blueprints for a continuing national survey to obtain current health information are being prepared by the Public Health Service in the event that such a program is assigned to it.





# What WHO Means To Us

By HERMAN E. HILLEBOE, M.D.

THOSE familiar with some of the inner workings of the specialized agencies of the United Nations have come to recognize that the international approach to such problems as health offers the best mechanism for assisting people of all nations to help themselves to a better way of life.

The majority of the member states that have ratified the constitution of the World Health Organization have proclaimed their determination to end isolation in the field of health. No nation has a monopoly on discoveries in the prevention, diagnosis, and treatment of disease. Roentgen of Germany gave us the priceless diagnostic tool, the X-ray, and Einthoven of the Netherlands placed in our hands the electrocardiograph. To the scientists in Britain, we owe the discovery of penicillin; to those in Canada, the discovery of insulin; and to our colleagues in Switzerland, the great weapon against malaria—DDT. In public health, as in no other field of worldwide enterprise, we have true interdependence in the discovery and sharing of knowledge of prevention, diagnosis, and treatment of disease.

Through the years, there have been several international organizations that have contributed to international health, but it was not until the birth of the World Health Organization in

1948 that the pattern was so clearly cut as to what should be done and how to do it.

## Role of the United States

Some may not be familiar with the details of the United States participation in world health programs. The Public Health Service supplies services to the Public Health Division of the International Cooperation Administration for the recruitment and staffing of overseas missions as well as technical program reviews and professional consultations. The Division of International Health of the Public Health Service is also the center point around which turn the efforts of both multilateral and bilateral health assistance.

The International Cooperation Administration is our official arm for technical assistance. Its programs are under the policy guidance of the Department of State and are now operating in more than 40 countries. As a result of joint conferences on the regional basis between the World Health Organization and the International Cooperation Administration, as well as intracountry planning, many of the programs are being supported by joint effort on the part of WHO and ICA missions. This type of effort has resulted in a sound approach to health problems where the two organizations may supplement each other in their assistance programs.

In 1949 the United States embarked on a program to make the benefits of its scientific advances and industrial progress available for the improvement and growth of less developed

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*Dr. Hilleboe is commissioner of the New York State Department of Health and president of the American Public Health Association.*

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areas. The enterprise—known as point 4—was to be a cooperative one in which nations would work with the United States to improve the human economy. The aim of the program was to help the people of the world, through their own efforts, to produce more food, more clothing, more materials for housing, and more mechanical power to lighten their burdens. Technical assistance, which for decades has been given in a limited manner by American missionaries and private business concerns, was broadened so that a whole nation as a fundamental part of its foreign policy committed itself and its resources to the idea of helping all people to help themselves.

Expanded technical assistance programs have appeared all over the world in specialized agencies such as the newly created United Nations Technical Assistance Administration, the Colombo plan initiated by the British Commonwealth nations, and programs of technical assistance started by France, Switzerland, and Norway. These technical assistance programs have and must include health projects. Health is now recognized as closely associated with any economic and social progress. These programs represent a spirit of international cooperation, a refreshing development in the foreign affairs of benevolent nations. The regionalization project in Puerto Rico is an interesting example of a program with multiple sources of support.

Jonathan B. Bingham, former acting director of the point 4 program, in his recent book, "Shirtsleeve Diplomacy," says: "There are many things that diplomats and money can do but nothing compares to the permanent benefits of sitting down with people and actually doing things that show them beyond the question of a doubt that their health is being improved."

### **The Voluntary Organizations**

In discussing international health we cannot forget the pioneer work of the great foundations in developing health programs. The three United States voluntary organizations most actively operating in the international health field are the Rockefeller, Ford, and Kellogg Foundations. The International Health Commission established by the Rockefeller Foundation in 1913 has carried on its activities

successfully in the development of health programs on a cooperative basis. The Kellogg Foundation has done similar work in recent years in the South American Republics, especially in the field of nutrition. These are examples of foundations that have been instrumental in bringing about a modern concept of cooperation in building up within each nation sound and effective programs of disease control and health promotion.

The professional health workers and representatives of the great industries and other leading citizens represented here understand better than most groups the potentialities of the World Health Organization in contributing to world peace. It is the task of the National Citizens Committee for the World Health Organization to bring to the public information on the great potentialities of organizing for world health.

This committee in the United States makes known to our people the importance of good health to the well-being of the Nation. During the last two annual meetings of the American Public Health Association, public sessions were held by the National Citizens Committee for the World Health Organization. Purposeful activities are quickly understood by key citizen groups. With understanding comes acceptance, and with acceptance comes support. This citizens' movement could profitably spread to every nation participating in the activities of the World Health Organization, particularly those nations that have substance to share with less fortunate countries.

### **Health of One Is Concern of All**

There are many of you from other countries who are completely familiar with the important advisory, technical, and research services being performed under the leadership of the World Health Organization. It is significant that the World Health Organization has insisted upon qualified personnel to carry on its activities and that there be a balance of service, training, and research, for it is known that to provide service alone is not sufficient to obtain best results. It is necessary, from the beginning, particularly in less developed countries, to train local people to carry on the new techniques that are being demonstrated. It is equally important to give

the newly trained people an opportunity for exchange of ideas so that they can give the benefit of their experience to their colleagues.

The question has often come up in the United States, sometimes even among health workers, "Why should we support the World Health Organization?" This specific question deserves a specific answer.

As one who first worked with the Expert Committee on Tuberculosis of the Interim Commission of the World Health Organization from 1946-48, I visited many countries of the world, associated with the health leaders of many lands, and participated in some of the field services carried on by Scandinavian teams in their early BCG programs. In recent years, I have observed the work of the World Health Organization in the Far East and in South America. The quality of health leadership provided by the World Health Organization and the importance of demonstration and training when they are used as spearheads to help less developed nations to help themselves continually impress me.

No nation is compelled to support the World Health Organization against its will. No powerful nations are attempting to use influence to force other nations to give financial aid. Everything that is done for WHO is on a voluntary basis. We would not have it any other way.

The world will be strong only in proportion to the strength or weakness of its individual nations. Transportation and communication have changed so much in recent years that no one is now very far away in time from anyone else in the world. Disease can be transported over thousands of miles in a matter of hours. Animal and plant diseases can be carried with ease from one continent to another unless adequate safeguards are set up. Therefore, in the field of health the concern of one nation has now become the concern of all nations. There is nothing controversial about the need for health programs. It is a question of bringing to people the skills and knowledge to carry on preventive services under the leadership of local people.

We must assist WHO with everything that we can spare. We must concentrate attention on major health problems—this will not be diffi-

cult because the leaders of WHO have defined them and also have pointed out public health activities that will achieve global results.

The World Health Organization deserves our support because Americans believe in good health for everyone and not for just a chosen few. Good health contributes to a productive life in the community, which in turn gives the individual satisfactions that help him to live in harmony with his fellow man. Health helps to create in man the leadership qualities that are so urgently needed in so many communities today. The physical improvements that come from improved world health are only part of the story. Added improvements, in the form of emotional and mental stability, come with sound physical health.

The program of WHO should be supported because its failure would have a blighting effect upon so many nations. Already the results of joint programs under WHO are measurable in many countries in spite of the modest budget available for a worldwide enterprise. We need to support WHO so that it may keep pace with the other specialized United Nations programs directed toward the improvement of the welfare of people throughout the world. There cannot be social and economic improvement without improvement in health.

Funds spent for WHO are very modest in comparison to funds spent for other United Nations activities, and, in many cases, small in comparison to funds spent for public health in individual countries, and even in some of our States. New York State, for example, in 1955 has a public health budget of \$64 million for 16 million people. The World Health Organization budget for 1955 is approximately \$9,500,000 for the whole world.

### Interchange of Ideas

There are many direct benefits to member nations from WHO programs throughout the six regions of the world. Dr. Boudreau of the Milbank Foundation once said that "better health throughout the world is well worth working for but the experience gained by working together may prove, in the long run, to be of far greater value." This kind of interchange of ideas and this interchange of health

leaders throughout the world is a significant part of the World Health Organization.

In our New York State Health Department, for instance, more than 300 foreign visitors come each year to work with us, to observe, or to exchange greetings. From them we learn as much as we impart.

The professional interchange of ideas is of inestimable value. These scientific workers enter our professional lives and our social lives as well. They observe our culture and our customs; they listen to our music; they enjoy our art and read our contemporary literature. They have a chance to be guests in our homes and see how our families live. These are some of the indirect benefits from training programs on a worldwide basis. On the other hand, we send many American public health workers to foreign countries each year to improve their knowledge in special fields and, in some instances, to impart their special skills to other people who have requested their services. It is clearly evident that one of the great benefits of the World Health Organization, in its 8 years of activity, has been this exchange of scholars and scientists in medicine and public health, to the mutual advantage of all concerned.

In geriatrics and rehabilitation, for example, Scandinavian countries have programs far in advance of anything we are doing on a large scale in America. Physicians in their geriatrics hospitals have answers to many vexing problems confronting us in New York State and in other parts of America. Much more was gleaned from my Scandinavian colleagues on my visit to these countries than they could possibly have learned from me, yet we had the most delightful exchange of ideas and information. Since that visit we have continued to exchange publications and studies of mutual interest. These are the hidden assets of WHO which are of immeasurable benefit and are of a continuing nature.

This spring we had another demonstration of the universality of public health. Shortly after it was announced that the poliomyelitis vaccine trials of 1954 were a success, a mass vaccination program got under way. It started not only in the United States, but also in Canada and Denmark. We hope to learn the answers to many of the epidemiological ques-

tions concerning poliomyelitis from our colleagues in those countries.

In 1951, in preparing for civil defense responsibilities, I studied the use of whole blood under conditions of war in Korea. This afforded an opportunity to study the best way to use blood in field hospitals for relatively large numbers of serious injuries—practical knowledge which could be important in times of disaster. Teams of medical workers from many nations were caring for the wounded and teaching each other their native skills as they went about their routine duties. Here was international health in action.

### Need BCG Evaluation

On returning from Korea, I stopped at Taipei, Taiwan, and met a Taiwanese who had worked with me in the Public Health Service during the last war. His tuberculosis control activities in Taiwan, including BCG vaccination and mass X-ray examination, under difficult conditions of limited personnel, supplies, and facilities, obtained measurably good results because of the high quality of his work and his zeal. Again, I learned new methods in handling tuberculosis cases and found out many ways in which this disease affects people differently in different parts of the world.

In the Philippines, on that same trip, we discussed the need for the Tuberculosis Research Office of World Health Organization to collate data on BCG programs and to evaluate their usefulness as public health activities. It was not known how much the tuberculosis mortality and morbidity rates were reduced in whole communities or states by mass BCG vaccination. The lasting effects of BCG vaccine were not known. Since that discussion tens of millions of children have been tuberculin-tested and millions of nonreactors have been vaccinated by World Health Organization teams with the aid of UNICEF funds and supplies. There are some signs that BCG, under certain circumstances, can be useful in tuberculosis control. But we simply have no knowledge or measure of its effectiveness as a means of controlling the disease in a whole community. There remains, then, a great opportunity for WHO to determine, through demographic studies, the relative

value of BCG in the total array of tuberculosis control measures.

### Chronic Disease and Disability

There is needed also the same type of definitive studies on the role of new drugs and antibiotics in the prevention and treatment of tuberculosis. Such studies would be most welcome to public health workers all over the world, particularly in those countries where tuberculosis is still rampant.

On a global basis, cardiovascular disease provides a fertile field for epidemiological research that has scarcely been tilled. This research includes the study of the relationship of total fat content of the diet, fat and protein concentration in the blood, the development of atherosclerosis, and the morbidity and mortality from degenerative heart disease. Dr. Ancel Keys has worked with colleagues in England, Scandinavia, Italy, Spain, and Portugal, and, the past winter, among the Bantu in Africa. His intercontinental studies show promise of practical application in preventive medicine. As communicable diseases come under control in many countries and as the proportion of older persons increases with improved public health, the attention of WHO inevitably will be drawn to chronic disease and disability, to which heart disease is a principal contributor.

A survey of patients in the medical wards of several countries is bringing forth some meaningful data, with prevention possibilities, on the cause-and-effect relation of high-fat diets, cholesterol in the blood, and coronary artery disease. The native Bantu gets only 10 percent of his calories from fats and has very little atherosclerosis. The native American gets more than 40 percent of his calories from fats and is greatly affected by atherosclerosis. There are many variables still to be sorted out in this complex relationship, to be sure, but this type of international study in the epidemiology of cardiovascular disease offers hope for new knowledge in the control of a worldwide killer and disabler.

Whether we talk about the control of malaria in India, onchocerciasis in Africa, yaws in Haiti, schistosomiasis in Egypt, yellow fever in the Americas, or heart disease in Britain, we

are aiming at the improvement of the health of individuals, improvement of the status of the family, and an improved economic situation for the community.

If manpower is fundamental to all wealth, then this principal can be preserved and augmented by improving the quality of man's health. It is not easy to measure the benefits of public health in money alone nor is it possible for most people to comprehend astronomical monetary figures. Talking about the billions of dollars saved by wiping out malaria among 200 million people baffles the imagination. But when you go into the villages and see the happy families, productive workers, healthy mothers, and clean living quarters, you see values that leave a lasting imprint on your mind.

People need an inner drive to obtain good health for themselves. The leaders in WHO can help to foster that drive among their own people, and they in turn can pass it on to others. This is the kind of contagion that we are in favor of in WHO. This is the kind of service that builds physical and mental and spiritual health; it builds a sense of sharing and of co-operation in common desires that recognize no geographic boundaries. World Health Organization activities admit no barriers of race, creed, color, religion, or economic status. It is a partnership which is expanding and extending throughout the free world. It is a living demonstration to the underprivileged that many of them may improve their standard of life through the channel of better health.

Dr. M. G. Candau, the Director-General of the World Health Organization, last year cited the need for more trained personnel and the importance of environmental sanitation. Significantly, approximately 40 percent of the year's projects in all regions were mainly concerned with education and training. Member nations also were urged to assign high priority to environmental sanitation in all health programs and to make improvement of sanitary conditions a part of most projects, whether for the control of communicable disease or for the improvement of the health of particular population groups, such as mothers and children.

A combination of these vital factors was emphasized at last month's assembly in Mexico

City when the organization agreed in principle to act as a clearinghouse for the international exchange of information on the medical uses of radioactive substances. The WHO long-term program to train adequate technical personnel through fellowship consultants, study teams, and advanced courses in this important new field is reassuring.

The work of WHO reflects an increasing recognition of its real function—that of technical adviser in the development of national health services and of international coordinator of health activities, rather than a source of supplies and equipment and an aid for the temporary alleviation of certain problems.

In these days of speedy transport, we are almost living in each other's backyard. In learning to live so near one another, we have the opportunity and obligation to help improve

the health and well-being of our less fortunate neighbors.

We need to endorse healthful living by demonstrating that prevention of disease and disability is a wise investment of national resources. Health is incredibly precious, especially to those who have lost it and then repossess it.

Public health can play a leading role in united efforts to gain worldwide stability; it can do this through the World Health Organization by combating disease, poverty, and ignorance. This is, indeed, a cooperative international enterprise which must succeed. We are determined that it shall succeed, if only for the warmth of satisfaction that it brings to our hearts and for the peace and comfort that it brings to the minds and spirits of men and women in less developed countries of the world.

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## New York Seminars

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# Poliomyelitis

Dramatizing the importance of careful control and checking of diagnostic procedures, Dr. Salk, developer of the poliomyelitis vaccine, said he expected more "polio" in the summer of 1955 than ever before, with many ailments erroneously diagnosed as poliomyelitis because of the publicity surrounding the disease.

Dr. Frandsen, in his description of mass vac-

inations in Denmark with vaccine prepared in the Danish State Serum Institute according to Salk methods, reported there have been no complications and no cases of poliomyelitis among children vaccinated since April 12. Almost half a million children between ages 7 and 12 (98 percent of the population of that age group) have been inoculated. The Danes are inoculating in the skin rather than in the muscles. The second round began in June. A third shot is scheduled for next year.

Denmark expected to vaccinate the entire population under 40 years of age by the end of the summer. All inoculations are free. The vaccine is paid for by the state and issued to general practitioners. Frandsen expressed Denmark's gratitude to Dr. Salk and others responsible for the vaccine, after describing the severe 1952 and 1953 poliomyelitis epidemics in Denmark.

Dr. Korn's presentation of the factors involved in the evaluation of the 1954 field trials of the Salk vaccine in the United States stressed the voluntary participation in the study of 150,000 workers in 44 States and 211 local areas. Standardization of all procedures, including

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**Chairman:** Hart E. Van Riper, M.D., medical director of the National Foundation for Infantile Paralysis.

**Honorary Chairman:** Thomas M. Rivers, M.D., vice president and director, Rockefeller Institute for Medical Research.

**Participants:** Johannes Frandsen, M.D., director general, National Health Service, Denmark; Robert F. Korn, M.D., deputy director of the Poliomyelitis Vaccine Evaluation Center, Ann Arbor, Mich.; Jonas E. Salk, M.D., research professor of bacteriology, University of Pittsburgh.

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diagnosis and physical therapy, was one of the most difficult aspects of this undertaking. To avoid the presence of diagnostic errors in statistical summaries, diagnosis of poliomyelitis was confirmed when possible by isolation of the virus from the infected person.

Among the interesting factors in the 1954 evaluations was the significantly and progressively greater difference in response to the vaccines by older children. That is, vaccinated 6-year-olds had a poliomyelitis incidence of 40 in 100,000; those of the same age who were not vaccinated had an incidence of 55 in 100,000. At 7, 8, and 9 years of age, the differences between poliomyelitis incidence in the vaccinated and unvaccinated were much greater, with older children benefiting much more from the vaccination. The percentages for all ages indicated an effectiveness of 68 percent against type I poliomyelitis and of 90-100 percent against types II and III. These were the figures used for the final summary.

In reviewing the results of the field trials, Korns said that of the study population, 129 children contracted poliomyelitis. But 88 of that group had received no injection—they were among the controls. Seven had received a powerless injection, or placebo, and 10 had a single inoculation. Of the 34 cases that had some injection, 22 were nonparalytic. The 12 paralytic cases showed no localization in the injected arm as might be expected if the vaccination were the cause. The dates of onset of the disease showed no relation to the time of the injection.

Dr. Salk's detailed discussion of the vaccine itself brought out the fact that natural immunity to poliomyelitis is much higher in poor, undeveloped communities than in those with a higher standard of living. The explanation lies in early exposure to disease because of poor sanitation and similar conditions, with the resulting production of antibodies.

Salk's presentation was aimed first at explaining the principles of producing a noninfectious vaccine and, second, at the immunological principles involved in the use of the vaccine. The virus is inactivated by formaldehyde. Predict-

able proportions of viruses are inactivated each day, and thus a total virus population in a theoretical batch of 5 million cubic centimeters would be inactivated in, say, 12 days. Since the actual batch is no more than 50,000 cubic centimeters, there is a safety factor of 100. But tests of the vaccine from two different manufacturing laboratories do show differences. These are explainable as slight variations in time or temperature in preparation of the virus—the tiny factors that cannot be entirely controlled.

He described some of the ways in which antibodies are measured with a culture of monkey tissue cells. If monkey kidney cells are healthy and alive, the color in a test tube is changed from red to yellow in several days. In the presence of virus, the cells are destroyed, and the red color is retained.

After preliminary tests, a standard vaccine "A" used as a reference vaccine, was inoculated into children in cubic centimeter amounts of 2, 1, 0.5, 0.25, and 0.0625. The children's antibody response gradually diminished in direct proportion to the amount of vaccine.

With the more potent doses, all responded. At lower amounts not all the children responded after the first inoculation, but after the second shot, they all did.

The third dose, or more, of vaccine within a short time had no effect, even in producing a slight decline in antibodies. Thus, it was decided to space the third shot some months after the first and second for maximum immunity. The body apparently produces a measurable amount of disease-fighting chemical within a few weeks of the first vaccination: the second "shot" gives a measurable kick to the antibody production, and a third one, after antibody production has leveled off into a plateau some months later, provides a second important jump that levels off at that point.

It was found in the course of the study that children with an earlier slight natural immunity (blood samples were taken and level of antibodies determined) received a tremendous boost in antibody level from the first shot. It was also found that the noninfectious vaccina-

tions produce in toto a higher level of antibodies than is reached by a person convalescing from poliomyelitis. A natural infection produces more antibody than the first injection, but with the second and third, the vaccinations are superior to natural infection as immunizing factors.

Antibody persistence was measured in children vaccinated in 1953. The children were given three inoculations a week apart and a fourth 7 months later. Measurement of antibody activity a year later indicated that it maintained a steady high state.

Dr. M. A. Sanchez Vigil, director of the National Institute of Hygiene, Nicaragua, asked the panel if there was any possibility that a virus peculiar to the rhesus monkey, in whose tissues the vaccine culture is grown, could be transmitted to human beings by the vaccine. The answer was "No." The vaccine is tested for the exclusion of other viruses by direct introduction into the brain and tissues of extremely sensitive monkeys; the raw material is tested for disease-producing organisms and excluded if tests are positive; and other tests have shown that formaldehyde destroys other viruses much more quickly than the extremely resistant poliomyelitis virus.

Dr. J. J. Du Pre Le Roux, secretary for health of the Union of South Africa, asked if vaccination could reduce the incidence of natural immunity. The answer to this was "Not likely." Salk thought the duration of virus carriage will be reduced and that better hygiene will also diminish the incidence of virus carriage. Du Pre Le Roux also brought up the question of whether injection of the vaccine would have any effect of sensitizing girls to the Rh factor which produces problems in pregnancy. (The Rh factor is named for the rhesus monkey.) The answer was that in the vaccine filtering process the rhesus antigen is filtered out. Other pertinent data, as yet unreported officially, are the results of experiments on women who have by pregnancy or transfusion been made Rh sensitive. They were injected with the vaccine and showed no reaction to it.

## Pandemic Influenza

Influenza differs from other epidemic diseases in that, although mild cases are to be found at all times, there is from time to time a worldwide flareup of a more serious nature. Diphtheria organisms, for example, are consistently present in a given population group, but the influenza virus disappears into a peculiar form of reservoir. Since man is the only host for the virus, the reservoir must be mankind itself.

The spread of influenza poses special problems. The disease would appear to arise at the same time in all parts of the globe for reasons at present unknown, but it has not been proved that influenza does not spread from particular foci. In 1918 and 1919, the disease seemed to appear suddenly for no known reason in many parts of the United States and the rest of the world. However, we are not sure that the influenza virus of that period is the same as the influenza virus types found at present.

After Dr. Horsfall opened a discussion of the potential medical burden of a present-day epidemic of influenza, the panel agreed that currently the total number of influenza cases was not as important as that of other respiratory diseases. When an epidemic, such as the recent outbreak at Fort Dix, N. J., does occur, there is, however, a tremendous burden on medical facilities. The peak of the epidemic at Fort Dix lasted 10 days. There were no fatalities, but 40 percent of the soldiers were hospitalized.

In discussing mutant influenza viruses, Dr.

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**Chairman:** Frank L. Horsfall, M.D., member, Rockefeller Institute for Medical Research.

**Participants:** John H. Dingle, M.D., professor of preventive medicine, Western Reserve University School of Medicine; George K. Hirst, M.D., chief, division of infectious diseases, Public Health Research Institute of the City of New York; Thomas P. Magill, M.D., professor of bacteriology, State University College of Medicine at New York; and Harry M. Rose, M.D., professor of clinical medicine, Columbia University.

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Magill pointed out that there may have been no sudden appearance of new virulent strains because we may have ignored the gradual changes that might have developed in the past. He believes that gradual mutation of the virus is the explanation for the otherwise inexplicable worldwide appearance of a new strain. All influenza viruses are compelled to mutate in the same direction, if they are to survive, because everyone has become immunized to previous strains, in approximately the same degree in comparative age groups.

Virus mutation appears to be continuous, making it hazardous to rely on a vaccine that has been made for longer than a year. Such a vaccine may not immunize because antigenic composition of the virus changes and also because viruses appear with new antigens. However, variations of antigenic composition do not appear to equate directly in terms of virulence of the virus. Antigenic composition and virulence appear to be independent characteristics.

Horsfall summarized the solution to the problem of future pandemics of influenza as lying in two possible methods of control: (a) immunizing populations against influenza, or (b) eradicating the agent, eradicating the reservoir, eliminating the chain of transmission, changing the host by changing his antibodies.

No presently known chemical substances will eradicate the influenza agent. Eradicating the reservoir is not practical since man is the reservoir. Studies have been made in the chain of transmission. The virus is airborne, and controlled experiments have been made in sterilizing the air by various means, including radiation, but these experiments have yet to show effective results.

Elimination of the chain of transmission means isolation. Altering the resistance of the host seems an attractive solution, but this consideration is still in the theoretical stage. There is no basis for assuming such a solution can be realized in the near future.

The vaccine used for immunological control should include the broadest possible antigenic variation. It is possible to include both A and B prototype strains of influenza virus in an aqueous vaccine, but it is not possible to include

more than 3 or 4 variations of the prototype in one aqueous vaccine. While agglutinant vaccines will accommodate a wide antigenic range, because they have a lanolin or mineral oil base, they require an emulsifying agent, which sometimes sets up a systemic or local reaction.

## Teaching Public Health

Of basic importance is the philosophy of training medical students in public health practice throughout their medical training and of avoiding the isolation of preventive medicine teaching as a discrete discipline, Dr. Smillie stated. He emphasized that medical school training in public health in the United States is not designed to prepare students to be public health officers. Graduate training in public health administration is offered by schools of public health, he said.

The initial aspect of public health introduced to first-year medical students deals with the statistical interpretation of medical data. This subject is taught through special departments of biostatistics as a separate course. In the second year of medical training, students are introduced to the general field of public health through a course which acquaints them with sanitation, communicable disease control, health education, and other activities. In addition, through the facilities of the New York City Health Department, students at the Cornell University Medical College gain familiarity with the organization of official public health services by means of field visits, inspections of clinics, and observations of environmental control programs.

It is recognized that, in principle, medical students are interested in public health and the other broad aspects of medicine only in their

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**Chairman:** Wilson G. Smillie, M.D., professor of public health and preventive medicine, Cornell University Medical College.

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first 2 years of training, Smillie commented. He pointed out that it would be fruitless to attempt such broad, theoretical training during the clinical practice years. However, he said, ways have been devised to continue the students' indoctrination and experience with preventive medicine and rehabilitation even during the clinical years. Whereas medical practice and training formerly were based upon two fundamental points, diagnosis and treatment, they have recently evolved into a four-point program, including prevention of disease and rehabilitation as well as diagnosis and treatment.

To integrate preventive medicine and clinical practice during the third year of training, all medical students continue their observations of clinical and home visit activities of city district health offices. In addition, each student who so desires, and Smillie emphasized that nearly everyone does, is made a health adviser to a family selected from the clientele of a teaching hospital that does not have a regular family physician. In this position, the student is responsible, under close supervision, for the total health of his assigned family for 1 year. Although this amounts to a spare-time activity, done mostly during evenings and weekends, the student must make regular visits to the family once every 2 weeks and must be available to them in time of emergency. It is felt that this program is extremely important in giving the student an insight into various ways of life and into the role of environment as it affects the health of people.

The third year field work in health offices and the family health adviser program are well coordinated, since all preventive medical teaching staff members have dual appointments in the New York City Health Department, and each of the eight city health officers is appointed to the teaching staff of the medical college.

In the fourth year of training, Smillie explained, all the departments of the medical schools join together to teach the student comprehensive medical care. In this program each student is responsible, under direction, for the complete care of a number of patients who come to the hospital. Thus, the student begins to consider, for his patients, prevention of disease

and rehabilitation following disease, as well as care and treatment during illness.

To explain the rather unique inclusion of rehabilitation in the preventive medical training program, Smillie pointed out that the reestablishment of the crippled child or the patient disabled by an accident to his suitable place in the community was formerly a function of the department of physical medicine. Now felt to be important in the total care of sick people, rehabilitation has been incorporated in all departments of teaching and administratively centered in the department of preventive medicine.

## Insectborne Viruses

Man is not an essential host for the maintenance of the insectborne viruses, but it has been shown that antibodies to several viruses are common in the human population, Dr. Theiler asserted. During the years that the Rockefeller Foundation was searching for yellow fever virus in Africa and the Americas, new distinguishable viruses were found, he said. These new viruses were all transmitted by bloodsucking arthropods, and all were maintained in cycles involving the arthropods and the wild animals.

By the systematic use of the hemagglutination inhibition test, two groups of viruses have been distinguished. Group A includes eastern, western, and Venezuelan equine encephalitis,

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**Chairman:** George K. Strode, M.D., director (retired), international health division, Rockefeller Foundation.

**Participants:** Max Theiler, L.R.C.P., D.T.M. and H., director, Rockefeller Foundation Virus Laboratories in New York City; Fred L. Soper, M.D., director, Pan American Sanitary Bureau (Regional Office WHO for the Americas); Hilary Koprowski, M.D., assistant director, viral and rickettsial research, Lederle Laboratories Division of American Cyanamid Co., and member, WHO Expert Committee on Rabies Control.

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Semliki Forest virus, and Sindbis. Immune serum prepared against any one of these will inhibit agglutination to a high titer with homologous antigen and, to a lesser extent, with an antigen prepared from any other virus of this group. Certain members of group A have a wide distribution. For example, protective antibodies to Semliki virus have been found in populations of Central and South Africa, Malaya, Borneo, and the Amazon Valley.

The second group (group B) is composed of Ilheus, Ntaya, West Nile, Uganda S, Zika, St. Louis encephalitis, Japanese B encephalitis, Murray Valley virus, Russian spring-summer encephalitis, yellow fever, and dengue. These viruses have a worldwide distribution. An immune serum containing antibodies to any one of this group will inhibit hemagglutination of red blood cells by an antigen prepared from other members of this group but not by an antigen prepared from viruses belonging to group A. The immunological overlap in group B is far more marked than in group A.

The hemagglutination inhibition test is group specific not strain specific. The immunological overlaps have theoretical as well as practical implications. Theoretically, it is probable that the immunological overlaps point to a common evolutionary ancestor. Practically, it is conceivable that an individual immune to one member is relatively immune to another member of the same group.

Extensive testing in various parts of the world indicates that many virus infections are common in man. Almost 100 percent of Egyptian adults were found to show antibodies of West Nile virus. A rational explanation of these infections throughout the world is, at present, not possible, Theiler commented.

*Aedes aegypti* is known by experiment to be able to transmit almost all of these viruses, but only yellow fever and dengue are known to be transmitted by this mosquito in nature. *A. aegypti* is present throughout the tropical and subtropical regions of the world, but it has transmitted yellow fever only in Africa, the Americas, and, in ancient times, southern Europe. Epidemics of dengue, in contrast, have been reported in all tropical and subtropi-

cal regions. Recently, in Trinidad, an outbreak of jungle yellow fever among men and monkeys was discovered. Despite *A. aegypti* prevalence throughout the island, no *aegypti*-borne epidemic occurred. Theiler suggested that extensive immunity to dengue prevented the development of an epidemic involving man-*aegypti*-man. The suggestion is based on the immunological relation between yellow fever and dengue. Should this hypothesis be confirmed, it may explain many of the known facts on the distribution of the arthropod-borne virus infections.

Dr. Soper, in discussing the yellow fever threat, asserted that although yellow fever has been virtually eliminated in the United States much of the southern part of the country is considered by the Public Health Service to be receptive to the disease.

Soper illustrated the fluctuations in the incidence of the disease with maps. Brazil had fewer than 10 cases a year from 1946 through 1950, but had 223 cases in 1952 and 39 cases in 1953. Bolivia had 354 cases in 1950, 3 cases in 1951, and 1 case in 1952, but in 1953, there were 18 cases. In many areas of the Americas, there were intervals when yellow fever did not appear at all, he added. In a few areas, yellow fever was known to be present constantly.

*A. aegypti* is found no longer in Brazil, Paraguay, Bolivia, Peru, and Ecuador. However, northern Argentina, the coasts of Mexico, many Caribbean islands, and areas along the northern shore of South America are still infested.

In the areas where yellow fever is constantly present, the disease is endemic in the monkey population and sporadic in the human population. The disease, from time to time, spreads from its endemic areas in the forest. If the disease spreads to an area infested with *A. aegypti*, an epidemic may follow. The threat of yellow fever is permanent in the Americas so long as there exists an area in which *A. aegypti* is present.

Dr. Koprowski outlined the rabies problem and mentioned the successful efforts in Malaya and Israel to control the disease. In most countries, Koprowski said, the key to the problem is the dog population, although the disease

affects a wide range of animal life. Since the dog lives in close association with man and is especially susceptible to the rabies virus, concerted effort must be directed towards eradicating the disease in the dog population. The newer vaccines can be relied upon for effective control, but the more traditional methods of establishing control of rabies in the dog population should not be neglected.

## Mental Health Programs

Team members, introduced by Dr. Levine, demonstrated the team approach to psychiatric orientation in the pediatrics department of New York Hospital-Cornell University Medical College. The team included an occupational therapist, a nursery school supervisor, a child psychiatrist, a person in charge of comprehensive medical care and teaching, a resident in pediatrics, and a child psychologist, among others.

In their discussion of the hospital's teaching program in pediatric rehabilitation, members of the pediatrics department stressed the need for instilling in pediatricians an awareness of the psychological factors in child development. They also emphasized the need for "preventive psychiatry" for the general population. This would necessitate getting to the children early. The hospital's pediatrics division includes opportunities for observing well children in a nursery school, work with sick children and

their parents, parent discussion groups led by psychologically oriented pediatricians, a careful followup program for medical students and residents, and extension of the physician into the community beyond his ordinary medical concerns.

In addition, the pediatrics department itself tries to resolve the emotional and psychological problems of the children who are cared for at the hospital. Recognizing, for instance, that a stay in a hospital and illness are traumatic, it has lengthened parental visiting hours to help reassure the child. The new visiting hours—from 10 a.m. to 5 p.m.—are expected to work reasonably well, without interfering with hospital routine.

There are new methods of anesthesia. The basal anesthesia is given in the child's room, and the child's mother is waiting in the room when he awakens after anesthesia. Services of a psychiatric team are available for more intensive work when necessary.

The other two programs discussed were New York State's legislative support of community mental health services and the use of drugs in treating psychotics.

Dr. Lemkau explained the legislative structure of New York's first organized statewide attempt to give public support to psychiatry outside of mental hospitals.

State law provides for: (a) education and consultation with social agencies that need and can use psychiatric services in casework; (b) promotion of psychiatric outpatient services in hospitals; (c) promotion of rehabilitation for persons who have been psychiatrically ill; and (d) psychiatric sections in general hospitals. Specifically excluding specialized mental hospitals, the program is aimed at the spread of psychiatric influence and information in general medical practice and in community services.

Although, in effect, the State subsidizes the program, there is no State direction. A board is to be set up in each community for the administration of the law. Problems of the board involve integrating the program with city health centers, cooperation with the schools,

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**Chairman:** Frank Fremont-Smith, M.D., medical director and executive secretary, Josiah Macy Foundation.

**Participants:** Henry Brill, M.D., assistant commissioner of the department of mental hygiene, New York State Department of Health; Paul V. Lemkau, M.D., director of the New York City Community Mental Health Board and professor of public health administration, Johns Hopkins University; S. Z. Levine, M.D., professor of pediatrics, Cornell University Medical College.

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and, possibly, the removal of barriers between bureaus in a city.

Dr. Brill discussed the place of drug therapy in mental health programs. The two new drugs, reserpine and thorazine, that are being used for treating extremely disturbed patients have benefited them, he said, "in a way we have never seen before. That, to us, is a miracle."

In hospitals using the drugs, the need for electric shock treatment, physical restraint, and seclusion has to a certain extent been reduced. And more patients have been made accessible to psychotherapy. This has increased the need for psychotherapists.

Reserpine is derived from a plant, *rauwolfia serpentina*, which has been used in India for more than 100 years for the treatment of mental disorders and hypertension. It has been known in this country for only 2 or 3 years. Chlorpromazine, or thorazine, known in this country only a little over a year, was new in central Europe 2 or 3 years ago.

Brill concluded with the observation that the new drugs have definitely proved that pharmacology has a place in the treatment of mental disorders.

## Nutrition

The elements of a nutrition program consist of appraising the diet of the people in an area and formulating steps for improvement if necessary.

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**Chairman:** H. D. Kruse, M.D., Sc.D., executive secretary, Committee on Public Health, New York Academy of Medicine.

**Participants:** Norman Jolliffe, M.D., director, bureau of nutrition, New York City Department of Health; Charles Glen King, Ph.D., scientific director, the Nutrition Foundation, and professor of chemistry, Columbia University; Herbert Pollack, M.D., Ph.D., associate professor of clinical medicine, New York University.

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Appraisal includes clinical examination for deficiency diseases, biochemical examination of blood and urine, and determination of nutritional status by a study of food values for each country, according to a table of values.

To improve nutrition in each country, it is desirable to fit domestic production of needed foodstuffs into a diet and way of life acceptable to local custom and tradition.

People may not know they are suffering from malnutrition, Dr. King said. If Central American children survive the first 5 years—and half do not—they are chronically ill. These survivors have plenty to eat and are not hungry, but they do not realize they are undernourished.

Because weaned infants are fed a diet of corn, in the form of tortillas plus beans and some fresh fruit, they soon show signs of serious protein deficiency. Their total protein intake may be high, because beans are high in protein value, but it is not complete protein or sufficient to develop normal bodies.

Within 6 months, height, weight, and skeletal development show retarded growth. The food intake pattern shows vitamin A and riboflavin deficiencies, confirmed by blood and urine analysis. Iodine deficiency results in a prevalence of goiters.

The United Nations Children's Fund attempted distribution of dry milk powder. Some was sent to the schools; however, it was found that the nutritional damage had occurred before the children entered school.

In evaluating the dietary of a people, the results of the biochemical surveys of the body fluids can be predicted from the clinical symptoms, and vice versa, according to Dr. Jolliffe. The prediction must be confirmed, however.

A clinical examination of 6th grade students in Formosa showed that 78 percent of the children had lesions at the corner of the mouth, known as angular stomatitis. This symptom is an almost sure sign of riboflavin deficiency, particularly when a magenta tongue and lesions around the nose and scrotum are also observed. Urine examination, on the other hand, indicated a riboflavin deficiency in 68 percent of the children. Formosa has a high incidence of anemia,

which sometimes produces similar symptoms, or the percentages might have been even closer.

To determine vitamin C deficiency, physicians look clinically for marginal gingivitis—tenderness and bleeding of the gums—and then biochemically for vitamin C in the blood or urine. According to Jolliffe, when the percentage of marginal gingivitis is found for a study group in western countries, the physician can “hit on the nose” the percentage of vitamin C deficiency found in the urine. A Newfoundland survey showed how this close relationship works: Marginal gingivitis was 38–40 percent; the body chemistry indication was 30–35 percent.

In Formosa 30 percent of the children showed marginal gingivitis, but there was no blood chemistry indication of a vitamin C lack. Actually there was only 1 real case of scurvy in the school population of 1,000 and no scurvy generally in the population.

Getting the dietary status, Dr. Kruse said, can be a crude matter of totaling the amount of food produced and the amount imported, then dividing the total amount by the number of people. Other methods are asking persons to write down what they eat, interviewing individuals about their eating habits, and questioning careful local observers about what people eat.

Local dietaries are sometimes puzzling. Dr. Pollack told of a dietary in Formosa reported to be extremely low in calcium. The average intake was 250 milligrams a day. There were no signs of deficiency although they should have been present. Perhaps the metabolism of the Formosans differs from that of other people, or perhaps there is some unknown calcium in the diet.

By accident, it was found that rice millers in the Far East use a “stone powder,” actually chalk or calcium carbonate, to facilitate the flow of rice in the mill, adding it in the amount of 1 percent by weight. Even after washing and cooking, 1 gram of rice contains about 1 milligram of calcium.

Thus, with an ordinary diet of about 500 grams of rice, the calcium intake from rice alone is 500 milligrams. This amount, added to the

250 milligrams from vegetables, makes a respectable 750 milligrams of calcium a day, considered to be adequate for a man 5 feet 3 inches tall, living in a land of intense sunshine.

When the question was raised about milk substitutes in the Far East, where milk production is low and not expected to be adequate for some time, Dr. King said that milk formed an excellent educational nucleus for a nutrition program since it is the most efficient food for children in its content of vitamin A, calcium, riboflavin, and protein.

Much can be accomplished in the next 25 years in countries that seem unable to support livestock, he added. Poultry and cattle can be raised if they are fed silage and legumes. Coconut and soybean “milks” are constructive substitutes in the meantime. Soybean milk, however, has an appetite-depressing effect unless it is fermented or cooked.

The addition of fish to cereals and soups would very readily raise the protein content of the diet. A poultry industry could be built up quickly once the importance of continuous egg and bird production was understood in the far eastern countries where people sell birds for cash. Cottonseed and palm nut presscake would provide good protein supplements to rice and corn diets.

Jolliffe pointed out that, if cattle production were increased in order to increase milk production, land that is now producing directly for food would have to be put into grain production. Far eastern countries could not afford an unfavorable food ratio of production for animal feed, he said.

King replied that modern technology enables more food to be grown on less land, thus making more land available for grazing. Submarginal land could also be used. In one far eastern country, where it was thought that milk production could not be increased, eliminating the nonproductive stock and keeping records on each cow's production in 3 years brought about an increase in average milk production from 1½ pounds per cow per day to 20½ pounds.

Kiyoschi Saito, deputy director of the Institute of Public Health of Japan, said that

Japan tried feeding soybean milk to infants but found that this substitute retarded long-range development even though it seemed adequate for brief periods. Then Japan tried to increase the production of cow's milk because, although 85 percent of the babies are fed at the breast, 15 percent depend on cow's milk. Infant mortality decreased along with the sanitation of cow's milk. In 1954 the rate was 48 deaths per 1,000 births, as compared with 150 deaths 25 years ago. The price of milk has dropped to 20 cents a quart, which is not considered expensive.

The necessity of providing transportation and refrigeration must not be overlooked, Pollack said. Milk production suffers in a country which uses a cow both for carrying and supplying milk. In planning improved agricultural techniques, it is well to remember that when farming is mechanized, fuel is necessary, spare machine parts must be stocked, someone who knows how to fix a machine must be at hand.

When fish farming in ponds in the flooded rice paddies of the Far East was mentioned as another possible way of increasing the protein in the dietary, Pollack doubted the value of such a practice, saying that the nitrogen needed by the fish would not be replaced in the soil.

Dr. Roberto Munoz Urrutia of Chile mentioned that 20 years ago a Chilean consumed about 50 liters (about 50 quarts) of milk a year. Now the amount is about 102 liters. In 5 years the average Chilean is expected to be drinking about 150 liters a year.

There has been no improvement in transportation, in refrigeration, or in number of cattle in Chile. Instead, people are drinking the milk that formerly was wasted and using dry milk and dried skim milk. These changes are the result of consumer, producer, and government education. Once the problem was understood, it was easy to solve.

Chile is now working on introducing more fish into the diet to give the people more protein. Pilot experiments with an odorless, tasteless fish flour showed that children like and tolerate a bread flour containing a 10 per-

cent fish flour (presently imported from South Africa), yet do not know they are eating fish in bread.

## Tuberculosis Control

New types of chemotherapy have brought about a decrease in the death rate from tuberculosis, according to Professor Amberson. Now only 1 death is reported annually for each 5 or 6 new active cases, whereas formerly the mortality was 1 death for each 2 new active cases. In some areas, the panel reported, tuberculosis was disappearing completely in children and young adults.

Among the new drugs under study for the treatment of tuberculosis is pyrazinamide, which has been actively investigated by Dr. McDermott and his associates, Dr. Chaves told the delegates. Pyrazinamide is one of several chemical substances capable of modifying the course of tuberculosis. The drug at first appeared to be ideally suited for widespread use, but, unfortunately, it has proved to be too toxic to be used generally or indiscriminately.

Whether pyrazinamide can be successfully modified is still a question. Nevertheless, the demonstration in animals, by a laborious but precise technique which shows that it is possible to eradicate tuberculosis infection by this method, represents an unprecedented achievement.

Other drugs, such as isoniazid, are being used

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**Chairman:** Walsh McDermott, M.D., professor-elect of public health and preventive medicine, Cornell University Medical College.

**Participants:** J. Burns Amberson, M.D., professor of medicine, Columbia University College of Physicians and Surgeons; Aaron D. Chaves, M.D., assistant professor of clinical public health and preventive medicine, Cornell University Medical College, and supervisor of clinic, bureau of tuberculosis, Department of Health, New York City; Carl Muschenheim, M.D., associate professor of clinical medicine, Cornell University Medical College.

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today to treat tuberculosis. Replying to McDermott's question as to what forms of pulmonary tuberculosis should be treated with drug therapy, Amberson said that today there is a tendency to treat all tuberculosis with chemotherapy. However, he pointed out, drug therapy should be delayed until a complete diagnosis is available. The objection to immediate drug therapy is that the patient may be committed to a regime of treatment before a diagnosis of active tuberculosis is established; hence, before therapy is begun, one must be sure that active lesions are present. If the lesions are old scars, chemotherapy is not needed.

McDermott said that isoniazid could not be considered as a tuberculosis vaccine. However, Amberson pointed out, many patients are responding completely to chemotherapy and bed rest. Patients with lung cavities of from 3 to 4 centimeters may show no further improvement, and for such patients it would be necessary to consider lung collapse or surgery.

## Blood and Tissue Banks

The possibility of transmitting the virus of infectious hepatitis in whole blood transfusions or in fibrinogen is a blood bank's most serious problem today, according to Dr. Kellner. Blood is never knowingly accepted from donors who have had the disease, since virus may still be present, he specified.

The greatest danger, Kellner said, is in the transfusion of whole blood. He indicated that he would chance the risk of hepatitis virus in the fibrinogen fraction (sometimes used to help coagulate the blood in cases of hemorrhaging

after childbirth or after lung or liver operations) if someone were bleeding to death. Attempts have been made to sterilize fibrinogen and some is now virus free, he noted.

In answer to a question about the use of blood transfusions for leukemia patients, Kellner reported that many leukemia patients are kept alive with transfusions, although blood is no cure for leukemia. Some children with leukemia are kept alive for 10 to 15 years by blood transfusions every 2 or 3 weeks, he said.

Asked if fibrinogen would help to coagulate the blood of hemophiliacs, Kellner replied in the negative, adding that hemophiliacs lack prothrombin, another important element in coagulation which acts on the fibrinogen to form fibrin.

Concerning the possibility of using animal blood, Kellner indicated that he did not expect ever to use whole blood from animals. During the war, an attempt was made to use one fraction—the albumin of cow's blood—but even this evoked serious sensitivities, and it was discontinued, he reported.

An eye bank's greatest problem is in getting a sufficient number of eyes, according to Dr. Troutman. The eye bank at Manhattan Eye and Ear Hospital in New York receives only 30 to 40 eyes a week, and there is always a waiting list of about 500 people, he reported. Throughout the country, there are an estimated 10,000 to 20,000 persons who would benefit from corneal transplants.

Troutman explained that in addition to permission for an autopsy, the law requires that a donor separately will his eyes to a bank. It is sometimes felt that donating the eyes may interfere with the autopsy permission, he said.

In obtaining an eye, which is done within 3 hours of the donor's death, complete surgical procedures are used for sterilizing the tissues. The eye is taken out whole and placed in a sterile bottle on a moist ring of cotton. It is then refrigerated at just above freezing (32°–45° F.) until the corneal graft is made. The eye must be used within 3 days.

Sometimes eyes are received at the eye bank floating in a solution, Troutman remarked. These, he said, are not usable.

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**Chairman:** Aaron Kellner, M.D., director of laboratories, New York Hospital.

**Participants:** Edward B. C. Keefer, M.D., instructor in surgery, Cornell University Medical College; Richard C. Troutman, M.D., assistant professor of clinical surgery in ophthalmology, Cornell University Medical College.

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He pointed out that no attempt is made to sterilize the eye because of the thickness of the tissues. But even so, there is a very low incidence of infection, and the infection that does occur is usually attributable to stitch abscesses and has nothing to do with the eye itself.

New techniques are being used in making the grafts with a split thickness of cornea, he said. This makes the operation promising in cases where formerly it was not. Troutman mentioned as another technique under investigation quick freezing of the cornea alone, which would enable it to be kept longer. After being treated with glycerol, the cornea is quick frozen, held at a temperature of  $-79^{\circ}\text{C}$ ., and thawed just before use.

Asked if the eyes of newborn babies are ever used, Troutman said they are, even those of still-born babies, although the eye bank prefers those of fetuses that are at least full term. Eyes are usable as long as the cornea is clear, and there is no relationship between the age of the donor and the clarity of the cornea, he said. Statistically, however, there is some evidence that the transplant is better when the eyes are a bit older, he added.

The eye bank at the Manhattan Eye and Ear Hospital, which was established in 1945, is a nonprofit private enterprise. Donors are not paid for their eyes, and they are given to patients at no cost. Transportation for them to and from the main bank and the branch banks is furnished free by the Red Cross and the airlines. The bank is national and also handles some overseas distribution on a rotational and emergency basis.

Blood vessel banks, and more specifically banks for storage of the largest artery in the body, the aorta, were discussed by Dr. Keefer. He listed three ways of preserving arteries: by refrigeration, which permits them to be kept for 6 weeks; by freezing, which enables them to be kept for a year (at  $-70^{\circ}$  to  $-80^{\circ}\text{C}$ .) in dry ice; and by freeze-drying under vacuum, which enables them to be kept indefinitely. Arteries to be preserved by the latter method are sterilized by ethylene oxide, high-intensity electron beams, or beta-propiolactone.

## Control of Cancer

Memorial Center for Cancer and Allied Diseases—the first institution of its kind in the United States—is extending its efforts toward improving the rate of cure of cancer and toward defining and eliminating the causes of the disease. Sloan-Kettering Institute is the research subdivision of Memorial Center.

Curing cancer involves the search for a better means of curing local cancer and for techniques which, it is hoped, will come from future research for curing disseminated cancers. Curing local cancer involves early diagnosis and extirpative measures currently employed, such as surgery and radiation.

Despite the massive effort to educate the public, improve cancer detection methods, and treat early cancers, the resulting decrease in the death rate is almost wiped out by the continuing increase in the rate of respiratory cancers, Dr. Rhoads pointed out.

At Sloan-Kettering Institute, Rhoads said, an effort has been made to regard and handle cancer cells according to the Henle-Koch postulates for the presence of infectious agents: that is, (a) to detect the presence of the organism in affected tissue, (b) to cultivate the organism successfully in a culture medium, (c) to induce the disease by inoculation of an organism with the culture, and (d) to induce an acquired resistance to the disease.

Cancer cells conform to the Henle-Koch postulates in that the cells are identifiable in human tissue. They can be grown in a test tube in which the colonies show forms similar to

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**Chairman:** C. P. Rhoads, M.D., scientific director, Memorial Center for Cancer and Allied Diseases, and director, Sloan-Kettering Institute.

**Participants:** Emerson Day, M.D., director, Strang Cancer Prevention Clinic, and chief, division of preventive medicine, Sloan-Kettering Institute; Leopold G. Koss, M.D., director of cytology, Strang Cancer Prevention Clinic; Brewster Miller, M.D., director, professional education, American Cancer Society.

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those of other cultures, and they can also be grown in eggs.

A culture can be implanted in the membrane of a chick embryo. The hatched chick will bear disseminated cancer nodules. These chicks are sent to other laboratories for biological and chemotherapeutic study.

Cancer may be induced in both animals and human beings by back inoculation with the test tube culture. The culture grown in the test tube shows the morphology of the original tissue long after the death of the person from whom the tissue was removed.

Sloan-Kettering harvests weekly about 3½ pounds of different types of cancer tissue from animals in which cancer has been induced. Implants are sent for confirmation to other laboratories.

The work at Sloan-Kettering and similar investigations have led Rhoads and others to believe that it is proper and profitable to seek control of disseminated cancers by chemotherapy. Selective destruction of cancer cells in animals has already been achieved by chemical methods at Memorial Center, but a chemical method for completely destroying cancer cells in man is still to be found.

In describing the work of the American Cancer Society, started in 1913 and now represented in all States and in Alaska, Dr. Miller first presented statistics on the incidence of cancer and then described the society's fund-raising methods, allocation of funds, sponsorship of research, and methods of education.

Public education methods include advertising the "seven danger signals," publication of informative literature, maintenance of information centers, use of radio and television, production of a film on breast self-examination, and considerable professional educational material.

On examining the society's material for the public, diplomates of the American Board of Psychiatry expressed these opinions: 11 percent disapproved, 7 percent saw some harm in the material but had no opinion as to whether the harm outweighed the good, 16 percent felt the material was harmful to some extent but thought the good outweighed the harm, 43 per-

cent thought the material was good. Twenty-one percent expressed no opinion.

Dr. Day is convinced that worldwide statistical surveys and other studies may produce clues to the prevention of cancer. The Strang Cancer Prevention Clinic, which is aimed at presymptomatic detection of cancer, receives about 40,000 annual visits from some 22,000 persons, he reported. The clinic's record of proved diagnoses varies with the ease of accessibility of the cancer site.

At the clinic the examining physician is expected to record a complete history and perform a systematic physical examination. Proctosigmoidoscopy, by which tissues in the rectum and colon are made visible, is a particularly successful technique, and, although now used for all persons over 45 on a return visit, Day believes it should be part of the basic examination pattern for everyone, at least once. Basic examination includes laboratory examinations of blood and urine and X-rays of the chest.

Cytological examination of a smear taken from female genitals is the closest to a successful detection method so far developed. Two-thirds of all the detection of cancer of the female genitals made at the Strang clinic is solely from microscopic examination of the cells aspirated or swabbed from the cervix and vagina. There were no other leads to such diagnosis.

Dr. Koss, whose speciality is microscopic study of cancer cells, described the principles behind the Papanicolaou smear test. Any growing surface tissue (epithelial tissue) has a constant turnover of cells—new cells replace the cells that are shed. Cancer cells are shed much faster than the cells of normal tissue, are not as adhesive as the cells of normal tissue and are much more easily removed, and have a tendency to accumulate in a body "receptacle" from which they can be collected. In lung cancer, the cells accumulate in the lumen of a bronchus. When the person coughs, the cells are brought up to a point where they can be collected. When the uterus is cancerous, the cells collect in the vagina.

Papanicolaou's enunciation of technical standards for the preparation and interpreta-

tion of the morphology of cancer cells and his directing of attention to organs that were not being explored by existing diagnostic means represent a great step forward in cancer detection. Extensive experience and training are needed, however, to handle cytology successfully, Koss pointed out.

Next to cancer of the breast, cancer of the cervix is the most common type of cancer in women. In a few decades no woman should die from this form of the disease, Koss believes. It is now recognized that early cervical cancer is a surface phenomenon: at this stage it does not penetrate the underlying tissue and is 100 percent curable. The cells behave like those of invasive cancer and are easily recognized by cytological examination.

A recent development in cancer cytology is the promise of a machine to screen cell and nucleus diameters mechanically rather than have them examined in the tedious way now employed. Such a machine is currently being tested.

## National Pharmacopoeias

The importance of an international pharmacopoeia which lists standards for approved prescription drugs and their indicated usages was the theme of this session.

Dr. Cook gave a brief history of the development of this essential element in world health

progress. Discussion started in Europe more than 100 years ago and led to the formation of the International Pharmaceutical Congress. The congress met in Chicago in 1893 and resolved to develop an international pharmacopoeia. The problem was again considered by the League of Nations, but the work was interrupted by World War II. After the war, when the United Nations was created, one of the first steps taken by the World Health Organization was the reorganization of the pharmacopoeia program.

In 1951 the first volume of the First International Pharmacopoeia was published. It provides standards for about 200 basic drugs, but only a few preparations. Volume II is now in preparation.

Dr. Miller pointed out that fewer than 20 countries today have pharmacopoeias of their own. He said this means that many countries do not have legal standards of purity for drugs, and added, "These countries are in a delicate position because they must import drugs on faith. The International Pharmacopoeia therefore should become a major contribution to public health."

It was pointed out that many of the countries which do not have a national pharmacopoeia use one of those developed by some other nation. However, Dr. Brady documented from his own experience the difficulty of practicing medicine and prescribing drugs in areas where there is no official publication.

Dr. Taylor described the work of the Combined Pharmaceutical Contact Committee of which he is chairman. This group assists in the preparation of the United States Pharmacopoeia by making recommendations for establishing standards and then, on a voluntary basis, conducting the research necessary to set such standards. Although the committee has no official status, its recommendations are usually accepted. Taylor said that he described this methodology in detail because it worked so well in the United States, and other nations might want to adopt it in preparing pharmacopoeias of their own.

Cook outlined the system used in the compilation of the International Pharmacopoeia. A

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**Chairman:** Lloyd C. Miller, Ph.D., director of pharmacopoeial revision, United States Pharmacopoeia.

**Participants:** Frederiek J. Brady, M.D., assistant chief, Division of International Health, Public Health Service; E. Fullerton Cook, D.Sc., chairman (retired), Committee of Revision, United States Pharmacopoeia, and former member, WHO Expert Committee on the International Pharmacopoeia; Frank O. Taylor, D.Sc., chairman, Combined Pharmaceutical Contact Committee of American Drug and American Pharmaceutical Manufacturers Associations, and member, Committee of Revision, United States Pharmacopoeia.

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tentative text was drawn up by an Expert Committee on Unification of Pharmacopoeias and the permanent Secretariat on Pharmacopoeias of WHO.

The tentative text was carefully revised by members of the committee with the help of specialists. All suggestions and criticisms were referred to Geneva and published in the official WHO circulars. These were then considered at the next meeting of the committee.

The galleys and page proofs of both volumes I and II were similarly handled by the committee and, in addition, the page proof of volume II was sent to the governments of all 85 member nations, inviting criticisms, comments, and suggestions. Cook added that if this policy is continued during the present revision of the First International Pharmacopoeia, the second edition would truly represent world judgment and justify the adoption of its standards in many national pharmacopoeias.

English, French, and Spanish editions of the International Pharmacopoeia are to be issued by WHO, with the hope that its sales will eventually cover its cost. WHO has also authorized translations by other nations, but only under WHO supervision; a German edition of volume I will soon appear. The Spanish edition of volume I is also promised soon. As the WHO program developed, the earlier committee of 7 pharmacopoeial experts was expanded, and an advisory panel of at least 30 specialists from 17 countries was appointed. These are experts in particular subjects and contribute information by correspondence or by attendance at sessions of the main committee.

The preparation of texts for the International Pharmacopoeia, however, is not limited to contributions from these appointees. Assistance and advice come from many other sources including the International Union of Pure and Applied Chemistry, the International Organization for Standardization, the World Medical Association, the International Pharmaceutical Federation, and from divisions of WHO, such as the groups studying malaria, tuberculosis, venereal diseases, plague, and so forth. Also a large number of other specialists located

in strategic points throughout the world contribute. The details of some tests for identity and purity or some assays, as incorporated in various national pharmacopoeias, may differ in minor details to meet different conditions, but the maintenance of equal quality, purity, and strength for essential drugs is the primary objective of the International Pharmacopoeia.

## Administration Techniques

Public health administration in the United States is "a happy marriage of voluntary citizen groups, other community groups, and official health agencies," Dr. Baumgartner pointed out. Public health programs are either aided or made possible by citizen and industrial groups. In New York City, where adequate government inspection of restaurants and eating places is impractical, programs of self-inspection for poor sanitary practices by restaurant operators, schools in the fundamentals of sanitation for management and employees, and employment of trained sanitary inspectors by chains and large restaurants have combined to assure clean, sanitary eating places with minimum official health activity.

In discussing attitudes of citizens toward public health, Dr. Baehr said that support of voluntary health organizations stems from the rugged pioneering development of this country. The first villages and settlements found it necessary to plan sanitary and disease

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**Chairman:** George Baehr, M.D., president, Health Insurance Plan of New York.

**Participants:** Leona Baumgartner, M.D., commissioner of health, New York City; Herman E. Hilleboe, M.D., commissioner of health, New York State; E. Gurney Clark, M.D., professor of epidemiology, Columbia University; Nathaniel H. Cooper, M.D., director of health and welfare, Health Council, New York City; William C. Spring, Jr., M.D., professor of public health administration, Johns Hopkins University.

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control measures cooperatively. Even after government assumed much of this responsibility, people expressed interest in their health by forming voluntary organizations to solve specific health problems. Baehr emphasized that "this peculiar American pattern of citizen participation and understanding underlies the great development of public health in this country" and that without it, the great forward strides which have been made would never have been possible. He cited, as an example, the role of the National Foundation for Infantile Paralysis in the development of the Salk poliomyelitis vaccine.

Dr. Hilleboe stressed two other types of public health administration carried on in the United States—relationships with State and local medical societies and interlocking directorates in health programs. Hilleboe cited two requisites for successful cooperation, that medical societies are not offended by either official or voluntary health groups and that all groups are talking about the same thing.

In the New York State Health Department's bureau of cancer control, the director serves as chairman of the voluntary cancer society. Thus, one individual can participate in planning, securing funds, program operation, and program evaluation. The State health commissioner meets with the executive committee of the State tuberculosis commission, 80 percent of which is nonprofessional, and assures cooperative planning, action, and policy. Hilleboe emphasized the two-way nature of such cooperation by explaining the practice of establishing special committees for the State health department, drawing upon voluntary group representatives on the committees for local thinking and expression.

Hilleboe outlined the State's responsibility in synchronizing its program with national and Federal programs and at the same time in assuring that city and county health programs are in tune with State plans. He stressed that poliomyelitis control involves problems other than vaccination, in particular, hospital treatment and care of chronically ill patients. Hilleboe outlined the procedure for the care of poliomyelitis patients, wherein the first 30 days

of hospital care are subsidized by the National Foundation for Infantile Paralysis and all care after that by New York State in its State Hospital for Crippled Children or, on a 50-50 matching basis, by local government in other hospitals.

Dr. Clark described the principal problems in venereal disease control. By 1953, after major accomplishments in control of venereal diseases, appropriations for the control program were drastically decreased. The resources of the American Social Hygiene Association and the American Venereal Disease Association were combined with those of the Association of State and Territorial Health Officers to take new bearings. Their surveys showed that, in the last half of 1954, 43 States experienced an increase in venereal disease, two-thirds of the States could not find ways of compensating for decreased Federal funds, and one-third had inadequate treatment facilities. This information resulted, Clark pointed out, in recent increases in Federal grants to States for the control of venereal disease, as well as in a better-informed public.

Dr. Cooper discussed overlapping, duplication, and failure to fill important gaps in health services resulting from the growth of voluntary agencies working in the same fields. He described the development of community and State health councils as a means of coordinating the programs of all citizen groups working toward better health.

Dr. Spring asked for caution in using statistics which tend to lead the public to believe that all disease and sanitary problems are solved or nearly solved. He stressed the work still to be done and urged that health workers demand continuing opportunities for disease control even in the light of greatly reduced disease incidence. Clark emphasized this point by citing the near-epidemic proportions of venereal disease in some towns and cities, although the general rate has dropped appreciably. In New York City venereal disease rates in some neighborhoods are higher than the rate for the city as a whole.

Clark pointed out the problems in areas where there is a desire for home rule and a reluctance

to lose local autonomy by turning health protection over to more distant governmental groups. In these cases, programs seemed to be leading toward health units composed of governmental health services voluntarily financed. Where home rule localities are not large enough to furnish tax money for adequate health service, a potential exists in voluntary fund raising and voluntary financial support for otherwise official government health programs.

Baehr emphasized that the most significant value of voluntary agencies lies in the participation and understanding of citizens, which have been responsible for the development and security of the official public health services in this country.

Several speakers noted the increasing importance of international efforts. The work of the International Union Against Venereal Disease in the exchange of information is an example of international cooperation. Baehr pointed out that voluntary citizen groups, such as the United States National Citizens Committee for the World Health Organization, although constituted in one country, work toward better health for the world as well as for the Nation.

## Rehabilitation Services

The present concept of rehabilitation evolved at the end of World War II, when it became apparent that the previous definition of ade-

quate surgical and medical care for the badly injured was not complete, according to Dr. Rusk.

It was determined that a man should not be discharged from medical care until he had reached the peak of his latent capacity, he said. It was discovered that this capacity should be determined with reference to both the man's disabilities and his capabilities.

The need for rehabilitation after World War II was dramatically demonstrated, he noted, by the fact that there were more than 2,500 paraplegics, over 2,000 more than after World War I. However, because of improvement in therapy, more than 1,760 of the paraplegics from the Second World War are now living, whereas only 2 of the First World War cases survived for a comparable period of time. Moreover, of the World War II cases, more than 1,200 are no longer in bed but have returned to civilian life.

Emphasizing the international aspect of the program of the Institute of Physical Medicine and Rehabilitation, Rusk pointed out that in rehabilitation there is an international language in which all can work out a program together. As many physicians from other countries are involved in the institute's program as are medical men from the United States, he remarked.

The institute no longer calls its work rehabilitation but considers it the third phase of medical care—the program that takes the patient from bed to a job, Rusk noted. This work is such that it must be done by a team. It involves an understanding not only of the medical diagnosis of each case but also of the patient's emotional problems.

When a patient comes to the institute, his medical diagnosis is reviewed by the team. Then the patient receives a psychological examination, and his case is reviewed by social workers.

Dr. Deaver described a series of tests he has devised called the Needs of Daily Living. Each patient is studied and graded on the basis of these tests, he said. The patient then comes before the staff of the institute and a training plan is outlined. Prosthetic and other devices

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**Chairman:** Howard A. Rusk, M.D., director, Institute of Physical Medicine and Rehabilitation, New York University-Bellevue Medical Center, and professor of physical medicine and rehabilitation, College of Medicine, New York University.

**Participants:** Donald Cobalt, Ph.D., assistant director, Institute of Physical Medicine and Rehabilitation; George Deaver, M.D., in charge of the children's division, Institute of Physical Medicine and Rehabilitation.

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are considered, and the possible development of the patient's capabilities is anticipated.

The institute designs many of its own prosthetic devices, some of them of an unusual nature. For example, for a man who had lost flexion of his fingers, a device consisting of straps of woven glass cloth impregnated with resin was designed. It fits over the back of his hand and over three fingers, permitting him to hold a pencil or a spoon or fork.

Dr. Cobalt pointed out that a wheelchair should be prescribed for a disabled or paraplegic patient just as carefully as a drug. The wheelchair should be planned to enable the patient to help himself to the greatest extent possible. One patient, a poliomyelitis victim, is now able not only to adjust his prosthetic devices without aid, but also to handle his demountable wheelchair. He can wheel himself to his car, get into the driver's seat, fold his chair, and bring it into the car after him.

In enabling people to live and work with what might seem to be insurmountable incapacity, the staff of the institute has the aid of nature itself, Rusk emphasized. Nature offers a tremendous overcompensation for physical defects as is shown by the blind, whose senses of smell and touch are greatly developed. Moreover, the conditions of civilization today are such that the average person needs to use only approximately 25 percent of his physical capacity, Rusk noted.

At the session, a number of current and former patients of the institute demonstrated their ability to handle prosthetic devices or to compensate otherwise for their disability. One was a 5-year-old boy recently arrived from La Paz, Bolivia, whose hands and feet are attached directly to the trunk of his body. A handsome, alert youngster, he has learned to move about by rolling like a tumbleweed, a technique that he happily demonstrated for the delegates to the World Health Organization. The institute is now developing devices whereby he will be able to walk upright, and other devices whereby he will be able to live normally.

Rusk asked the Vice President of Bolivia to consider the payment of a big fee for the institute's care of the boy: the establishment of rehabilitation centers in Bolivia where handi-

capped children can be retrained. The Vice President replied, "We will pay the fee."

## Pharmaceutical Production

Pharmaceuticals are only as good and as safe as the quality controls used in their manufacture, Dr. Brady said in pointing out that such controls account for 10 to 15 percent of production costs for pharmaceuticals in this country.

The application of the controls and the techniques used in the production of antibiotics were observed by the visitors during a tour of the Pfizer laboratories prior to this session. Fully described during the laboratory and process demonstrations were all the steps in the development and production of an antibiotic, from the search for, and isolation of, promising micro-organisms used to produce these drugs, through the packaging of final products.

During the discussion, Dr. Weber pointed out that three factors influence quality and quantity in the production of antibiotics: the particular strain of micro-organism used; the type of nutrient medium; and the type of equipment used in the fermentation and concentration processes. Pharmaceutical manufacturers producing antibiotics are constantly working toward improvement in all these factors. Essentially, Weber added, antibiotics must be toxic to disease organisms, nontoxic and well tolerated by humans, and not too difficult to produce.

Gaunt expressed the hope that antibiotics that will be effective against virus infections

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**Chairman:** Frederick J. Brady, M.D., assistant chief, Division of International Health, Public Health Service.

**Participants:** W. E. Gaunt, Ph.D., director of quality control, E. R. Equibb & Sons division of Olin Mathieson Chemical Corporation; W. Brooks Fortune, Ph.D., director, control division, Eli Lilly & Co.; E. M. Weber, Ph.D., director of biochemical research, Chas. Pfizer & Co., Inc.

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and bacteria now resistant to known drugs will be found soon. Special research leading to these goals is in progress and is also part of the screening program for all new antibiotics.

The question of whether a specific country should build production facilities for the manufacture of pharmaceuticals or import them depends not alone on building factories but also on the availability of raw materials, transporta-

tion, highly skilled personnel, and a potential market of sufficient size to support large-scale mass production which will make possible a low price that the public can afford. The speakers pointed out that the high standards of pharmaceutical production in the United States depends on a successful balancing of these factors together with cooperation between manufacturers and governmental organizations.

### Guests at Post-Assembly Technical Sessions

Dr. Abdul Zahir, *Afghanistan*; Dr. G. M. Redshaw, *Australia*; Dr. Josef Gratzner, *Austria*; Dr. P. Van de Calseyde, *Belgium*; Dr. Hernan V. Del Carpio, *Bolivia*; Dr. Raymundo A. Moniz de Aragao and Dr. Orlando Fontes, *Brazil*; Dr. Nealsmoeuk and Mrs. Nealsmoeuk, *Cambodia*; Urban Nelson, *Canada*; Dr. Don Lionel Joannes Kahawita; *Ceylon*.

Dr. Roberto Munoz Urrutia, Mrs. Roberto Munoz Urrutia, and Dr. Alfredo Riquelme, *Chile*; Dr. Joannes Frandsen, Dr. Oluf Andersen, and Dr. Bendt Sorensen, *Denmark*; Dr. Frederico Alvear-Perez, *Ecuador*; Dr. M. H. Aboul Ela, Dr. El Demerdache Ahmed, Dr. Mohamed Othman Shoib, Dr. Fathi A. Soliman, Dr. Nour El Dine Tarraf, and Dr. Hassan Saad Yusef, *Egypt*.

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| *United States technical assistance in Chile demonstrates how public health activities may merge with community or area development.*

## Public Health in Chile

By E. ROSS JENNEY, M.D., M.P.H.

THE RIBBON of land that is Chile is a much more logically bounded nation than it appeared to be when we first noticed its odd shape in our school geographies. In spite of its bizarre stretch from the bleak deserts of the north to the wet forests of the south, it forms a true geographic unit in the sense that it is a terrace between the world's longest mountain wall on the east and the emptiest reach of ocean on the west. It is strikingly like our own west coast in reverse latitudes, and the similarity of the Chilean and California central valleys brings frequent comment. But, unlike our west coast, it lies very much alone, a narrow, walled-off strip of sovereignty.

Chile does not have, as does our west coast, the immense advantage of being a part of a huge nation stretching to the Atlantic, which can supply capital and markets. Nor has it had, from the founding of Santiago in 1541 down to recent years, the advantage of those cultural drives that in the United States blocked the transplanting of European feudalism. Landed

estates—the *fundos*—were carrying family names into the third colonial generation when the Pilgrims touched Plymouth Rock, and until 30 years ago no change of the *patrón-peón* relationship was in sight. This rigid land tenure system molded economic and social life for four centuries, but it failed to cope with the needs precipitated by an increasing population in the 20th century competitive world. Failure was cloaked for a time by rich mineral revenue, first from nitrates and then from copper, but the country's economic inadequacy was eventually reflected in constantly increasing food deficits.

Although a paradoxically progressive and unusually comprehensive social legislation has been spread over this scene, it was supported in its early days by export products largely developed by foreign capital. Much of the national income has been derived by negotiation abroad rather than by economic planning at home, a practice which perhaps has had the effect of stultifying the concepts of self-development. Between the remnants of Iberian feudalism and the beginning of trends toward socialism, planned community and area development had no sponsor. This situation may be a major key to the slow progress in environmental sanitation.

### Health Priorities

In planning technical assistance in public health, the first priority for any area is always the major plagues that can be assailed with

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simple, effective techniques at small cost. Malaria and yaws have become classic examples. But where there are no such challenges, what then? What should we do in Chile, where no major scourges await penicillin or DDT? Here a literate, progressive, democratic, white population of 6 million people live in a favorable climate. There are no cultural blockades to hamper health measures. Indeed, highly trained Chilean technicians are drawing foreign students to their country, and many are serving abroad as public health consultants. In such an environment, less developed only in the economic sense and not handicapped by any natural health hazards, the impelling need is to contribute some technique that does not degenerate into a mere operational convenience and a vehicle for dollar credits. The problem, then, is to determine priorities on the basis of public health's most significant impingement on the economic dilemma without losing the integrity of the program by actually departing from the field of public health.

The health problems of Chile are not those of geographic environment and insect vectors. The major factors in disease incidence are those commonly associated with economic stress in a rapidly growing, overcentralized, somewhat stratified white society living in a temperate climate. Medical care has produced a substantial decrease in the incidence of those diseases which yield to therapy or which can be controlled by immunization. Poor progress has been made in health situations which are best handled by community effort inspired by local civic enterprise, that is, in environmental sanitation, housing, and nutrition.

#### A Socioeconomic Problem

Excreta disposal methods and water sources in rural areas have improved little since the colonial period. Latrines are often placed over irrigation ditches, which are the usual source of domestic water. The plentiful underground water sources have scarcely been touched. Population increase is greatly exceeding housing construction, and this situation is aggravated by disorganized population shifts resulting from industrialization and urbanization. Mushroom shanty towns—the *callampas*—



This well provides the first underground water ever seen in Peumo. It was dug by the men of the household, and cement capping and pumps were bought on credit from the Servicio.

surround Santiago, Concepción, and many other cities. Recent agricultural deficits and inflationary prices have added to an existing dietary deficiency. A definitely low health standard in nutrition coupled with poor sanitation is reflected in the notably high infant mortality rate, which was 252 per 1,000 live births in 1936 and has only recently dropped below 150.

The health services of Chile are almost completely socialized. The huge Beneficencia system, which had taken over the health services once provided by the church, was absorbed by the new National Health Service in 1953. Thus, sick benefits, hospitals, medical service, and public health were centralized in one large federal agency employing more than 33,000 persons. Many years will be required to put this organization in working order in a decentralized pattern. In the major cities medical services and facilities are of a high order, al-

though seldom elaborate, but this standard drops rapidly to a low level in country districts and to a near nil in the remote areas. Among the latter are the desert towns of the north, where water may be sold by the liter, and the forest lands of the far south, where 100,000 people live on the remote shores of the world's most intricate labyrinth of inland waters.

To find a sound footing for technical assistance in public health in a socioeconomic milieu of this type is a severe challenge. In such a highly centralized population (nearly one-third live in Santiago), one can expect little help from urban interests in planning programs for rural areas, where the present need is greatest and where the future hope of the economy most likely rests.

### The Health Servicio

The United States, through the Institute of Inter-American Affairs, has been providing technical assistance to Chile since 1943. As in other Latin American countries, the cooperative health program of the two governments is carried out through a Servicio, a special agency of the host government. During the first several years of the program, a commendable series of demonstrations was produced—complete health centers, sewage systems and disposal plants, rural and urban water systems, tuberculosis sanatoriums, strategic hospital construction and equipment projects, a building for a dried milk plant, assistance to the School of Public Health in Santiago, and others. Training of Chileans in health was an important part of these demonstrations, and more than a hundred trainees were sent to the United States. Although there can be no doubt as to the success of this period and although the projects have been turned over to the appropriate agency of the Chilean Government, the demonstrations, as such, soon reached their own limit of feasibility. An approach to more basic problems was sought.

In any economy there are gaps that need closing and bottlenecks that need widening, and some of these can be remedied in part with public health measures. When such a gap or bottleneck is identified and when the value of the remedial measure as a demonstration in relation to its cost is determined, a priority is es-

tablished. This approach is, to be sure, one that views technical assistance in public health as one aspect of economic betterment.

In Chile, rural sanitation and community self-sufficiency appeared to be the developmental gaps pertaining most directly to both the socioeconomic scene and to public health. Improvement in rural sanitation required control of excreta disposal and the tapping of underground water sources, the latter having an important bearing on agriculture as well as health. Development in community self-sufficiency required a plan to demonstrate the advantages of full utilization of local autonomy and to stimulate community initiative and sense of social responsibility. These objectives were combined by the health Servicio in a community development project in a rural area southwest of Santiago. This project, called the Peumo project after the town where the work is concentrated, was begun in 1951 with Dr. Theodore I. Gandy as chief of party.

### The Peumo Project

The area from which a site for a community development project was selected includes about 3,750 square kilometers of land and has a population of nearly 150,000. A few hours' drive from Santiago, it provided both the prerequisite of representative rurality and the administrative advantage of being accessible to the Servicio headquarters. The area is a fertile one. Citrus fruit, avocados, olives, and rice were grown extensively, but practically no vegetables were raised for home consumption. Contaminated surface water was used by more than 90 percent of the population in and around Peumo, and sanitary disposal of excreta was almost nonexistent. The early effectiveness of educational techniques used in approaching these two problems permitted a rapid extension of the project into other fields, including agronomy, home economics, and housing construction. In the process of extension, the project spontaneously evolved into a community development program acquiring local acceptance and participation, step by step.

No effort was made to define sharply the categories of activity: they fell easily into the basic pattern of health education, sanitary engineer-

ing, agronomy, and self-help housing. Agronomy soon included all phases of home economics. Operation of the project was based in a local headquarters, which contained offices, workshops, warehouses, a guest house, and recreation facilities. Existing citizen committees were utilized, and new ones were created to facilitate local participation. The resident chief of the project was an engineer on the staff of the National Health Service.

The transfer of technically trained Chilean personnel from the urban centers to this rural area resulted in the project's staff becoming involved in a host of activities that were peripheral to the first intent—suggesting recreational devices, designing a market, and planning improvement of the local hospital, for example. The quick wit of the community in availing itself of this indigenous but previously unavailable talent suggests that at least one cause for the lack of development in rural communities stems from an urban concentration of specialized skills rather than from any local recalcitrancy to technical innovation, lack of aptitude, or obtuse “cultural obstacles.”

Similar experience in community development has been derived at San Felipe, where in 1947 Chilean authorities, with assistance from the Rockefeller Foundation, began a project in which agronomy was combined with health center activities. The home economics phase of the San Felipe project has been notably successful in securing local response.

The health education phase of the Peumo project was so effective that there has been a consistent backlog of orders for latrines, wells, and pumps. Latrines are made with concrete base and riser with a seat of the type conventionally used in flush toilets. The wooden house has a pressed-asbestos sheet roof. Wells are capped with concrete and are supplied with the kind of hand pump commonly used in rural areas in the United States. The property owner digs his own latrine pit and well, and he buys the latrines and imported pumps on credit. Deep wells are drilled for large farms and for small community water supplies. A pattern now emerging is for communities to raise all or part of the funds for development of a well and water system before they request assistance.

Sometimes the Chilean Ministry of Public Works cooperates in such projects.

The program in agronomy began with spraying, fertilization, and cultivation of orchards, thus winning acceptance by initial concentration on improving the yield of cash crops. From this beginning, it branched easily into the purchase of seed for home gardens, food preserving, and home economics in general, all carried out by women's clubs. In an area accustomed to importing vegetables, the savings made in the home budget were quickly appreciated. Farmers soon formed cooperatives for collective purchasing of agricultural supplies and equipment heretofore seen only on the large estates.

Cement-block machines are provided for the self-help housing program. A cooperative of families is divided into three groups, and each group pools its labor force to construct one house at a time. Woodworking machinery is made available to the cooperative, and all materials are supplied on credit, the cost being reimbursed in modest monthly payments.

The Peumo project demonstrated two important lessons that may be assumed to be generally applicable to Chilean rural life. The first of these is that the use of local participation in an attempt to introduce a single improvement may lead spontaneously to a more inclusive community development project in which short-term impact can be combined with long-term advantages. The second lesson is that a Chilean rural community is eager and able to achieve group action in response to proffered assistance, to mobilize its resources, and to produce solutions to community problems with technical guidance and modest credit. Success in this respect is facilitated by choosing a locally felt need for initial action and only later fulfilling the possibly more basic needs, the knowledge of which has been engendered by education. This approach is what Foster terms “taking advantage of the pragmatic nature of people,” 1 of 12 essentials he lists for community development (1).

Under other circumstances, the health Servicio might have considered reproducing the Peumo project in various locations throughout Chile to exploit the potential of this method of stimulating self-help. The disadvantage of this procedure would be that its success would



**An agronomist explains how to grow vegetables among trees, as part of the Peumo project. Vegetables were formerly purchased from a distant town at high prices.**

be dependent on the effectiveness of demonstrations arranged in a spotted distribution pattern. In a country 2,600 miles long, with valleys isolated from one another by a rugged terrain, the spread of even the most contagious idea is geographically handicapped. Instead, the health Servicio chose to take advantage of the opportunity to participate in an area development program initiated by the Ministry of Agriculture and the agricultural Servicio.

### **The Area Development Program**

The plan for an area development program in Chile came into being in 1953. It evolved from the decision of the Ministry of Agriculture and the agricultural Servicio to concentrate their cooperative efforts in a large area of the country in order to produce a significant demonstration of methods which might correct the agricultural deficit so embarrassing to the national economy. Several national and international agencies are now participating in the program, which covers the three provinces of Maule, Ñuble, and Concepción in south central Chile, with a population of about 750,000. Although the agricultural phase has been in full swing for 2 years, the health Servicio has only recently joined the program.

This area development program, or Plan

Chillán, as it is called, offered an opportunity for integrating rural sanitation demonstrations with agricultural activities in a flourishing program sufficiently significant to attract national and international attention. With such integration, each community can sense the relation between its own efforts in health and the efforts of the area toward general economic betterment. The economic interdependence of health and agriculture can be demonstrated. This vitally important concept, it is felt, can be understood more readily through the medium of a large collective endeavor than through segmented programs located here and there.

The basic philosophy of the technical assistance program for public health in Chile, then, is this: A health project expanded into a community development program can carry improved technology to the community more effectively when it is devised as a partner in a team with agricultural and other activities. It can travel further into the national consciousness by this means than as an independent project. Even when a health project is very much a minor partner in a program, it is not in danger of losing its identity: on the contrary, it profits by its association with an endeavor that reaches national recognition and enjoys central government support.

Past experience has illustrated advantages of

integrated activity. In our own Tennessee Valley Authority enterprise, for example, each phase of the program, including health, achieved greater recognition through its association with TVA. In addition, the pooling of resources in a single economic objective draws host government ministries together and provides the opportunity for what may well be the greatest contribution of technical assistance, that is, the demonstration that integrated activity is a primary requisite of progress.

## Summary

With a successful pilot project in community development behind it, the health Servicio in Chile is now directing its major effort toward giving rural people a stake in economic affairs by developing underground water and by stimulating concepts of community responsibility in health, as part of an area development program.

These priorities were not derived by attempting to round out a health service in all its branches. Rather, they evolved from an effort to find one or two negotiable, long-range concepts that most certainly and most directly would improve the economy and living standards through health channels.

At the same time, there is a growing conviction among workers in Chile that where health problems are part of a socioeconomic complex (as opposed to concise environmental problems yielding to specific technical methods) they can be solved most readily by incorporating health activities in a broad endeavor, such as an area development program.

## REFERENCE

- (1) Foster, G. M.: Guidelines to community development programs. Pub. Health Rep. 70: 19-24, January 1955.

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## Rehabilitation Gains

In the first year after enactment of the Vocational Rehabilitation Act of 1954, the State-Federal rehabilitation program has tooled up under the new law, adjusted to related legislation, and laid the foundation for the future, according to the Office of Vocational Rehabilitation, Department of Health, Education, and Welfare.

The new legislation is designed to bring about a progressive expansion in the vocational rehabilitation programs. Improved rehabilitation services, support of training courses and traineeships for badly needed rehabilitation workers, and special research or demonstration projects are making it possible to increase the number of handicapped workers returned to productive employment.

Approximately 58,000 disabled persons became gainful workers during fiscal 1955—an approximate increase of 2,000 over the preceding 12 months. Federal grants amounting to \$30 million are available for the basic support of State and Territorial vocational rehabilitation programs in 1956. An additional \$2.6 million, to be matched with State funds, is scheduled for use in expanding rehabilitation centers.

The related legislation is the Social Security Act of 1954 and the 1954 Medical Facilities Survey and Construction Act. The State agencies determine whether a handicapped person is eligible to have his period of disability eliminated from the calculation of his monthly social security benefits. They are also concerned with surveys and plans to determine the needs for construction of comprehensive rehabilitation facilities.

# The Food and Drug Administration

—A Protector of Public Health—

By BRADSHAW MINTENER, LL.B.

ONE can hardly overestimate the importance of food, drugs, and cosmetics as a part of the human environment. Purity of these products is a health essential, yet any of the many thousands of products can deteriorate or be debased or contaminated in ways that will be injurious—even fatal—to the user. And, of course, any of them can be adulterated or mislabeled to serve the ends of deception and fraud.

Concern for health was largely responsible for the passage of the original Pure Food and Drugs Act of 1906. It had become known that poisonous preservatives and dyes were being used extensively in food products, that drug addiction was growing because of the unrestricted sale of remedies containing narcotics, and that a great many people were suffering tragic consequences because of their reliance on the claims being made in the labeling of widely advertised medicine. There is no doubt that the protection of health was and is the primary objective of our Federal food and drug laws, which will have their 50th anniversary in 1956.

The relation of drugs to health is direct and

obvious. The law requires them to be pure, fully potent, and labeled with adequate directions for safe and effective use. Food is required to be sound and wholesome, free of filth or harmful contaminants. Cosmetics, similarly, are required to be made from ingredients that are safe for use on the human body. Therapeutic devices must be labeled for their safe and effective use in treating diseases for which they are recommended. All these objectives are sought via the regulatory mechanism of prohibiting the shipment of misbranded or adulterated articles in interstate commerce.

In addition to the direct health importance of the foregoing requirements, the Federal Food, Drug, and Cosmetic Act imposes many requirements that have an indirect bearing on the health of the Nation. For example, it prohibits false and misleading claims on drugs which may lead the public to rely upon ineffective products rather than to seek competent medical care. Through food standards the law seeks to maintain the integrity of food so that consumers will get the nutritional values they have a right to expect. The enrichment of food under the law has made a decisive contribution to the elimination of deficiency diseases which once took thousands of lives every year.

Health violations—those which may be injurious to consumers—hold first place in the Food and Drug Administration's enforcement policy. Second are the sanitary violations, including those that may not be dangerous to

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*Mr. Mintener, assistant secretary for Federal-State relations, Department of Health, Education, and Welfare, delivered the address on which this paper is based at the 73d annual convention of the Proprietary Association held in White Sulphur Springs, W. Va., May 24, 1955.*

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health but offend common decency. Third are the economic violations—the marketing of products that cheat or swindle the consumer in some way, particularly products that cannot be detected by the reasonably alert purchaser.

While priority is given to those problems and cases involving health, there is an inevitable overlapping of these three fields of action. A sanitary violation may be a health violation. An economic violation, such as the substitution of an inferior or worthless ingredient in a food or drug, may also be a health violation. FDA inspectors are trained to work on all three. An inspector who is working on a suspected health violation will not overlook what he may find in the way of a filth violation or a serious economic violation. Sometimes the same product may violate in all three respects. For example, in the enforcement of the standards for cheese promulgated under section 401 of the act, the Food and Drug Administration is interested in this product from the following different standpoints:

*Health*—whether the manufacturer has met the requirements for using pasteurized milk or storing the cheese a sufficient length of time to cause the death of any pathogenic organisms which may be present.

*Sanitation*—whether the cheese was made from clean milk or cream in a sanitary plant. This has its obvious relation to health.

*Economic*—whether the product has been made from the ingredients required to be used in that particular kind of cheese and contains the minimum fat content and not more than the maximum moisture content permitted by the standards. Such requirements can be tremendously important in preventing the debasement of food in order to gain an economic advantage.

In the past there have been various proposals to split up the work of the Food and Drug Administration among other Government units according to functions or to products. Actually the present arrangement is much more efficient because one inspector ordinarily handles all of these different kinds of work and is not concerned entirely with food, or with sanitation, or with economic frauds. He works on all of them, but of course health comes first. Due to limitations of funds and staff, FDA now does very little by way of enforcing the law against

economic violations, and it has had to reduce somewhat its work against sanitary violations. It is trying to maintain full protection against health violations, but even in this area there are some activities which should be strengthened.

## The Food Field

What are some of the specific health activities carried on by the Food and Drug Administration in the food field? At the top of the list would be the efforts to prevent the use of poisonous or deleterious ingredients and contamination by dangerous micro-organisms. A few years ago the alertness of an FDA inspector prevented the shipment of a large lot of frozen peaches to which thiourea had been added to retard darkening. Thiourea is an acutely toxic chemical, capable of causing death.

On numerous occasions food and drug inspectors visiting food plants have spotted careless use of sodium fluoracetate (compound 1080). When used properly this compound is a very effective rodenticide, almost instantly fatal in extremely small amounts. Of course, it should be used only in locations where there cannot be any possibility of spillage on stored food products. Last fall thousands of pounds of frozen broccoli were voluntarily destroyed by packers after the inspectors found that several farmers had sprayed their fields with the wrong insecticide.

During a recent inspection of a plant making frozen chicken pies the FDA man found in the cold storage room a large number of pies that had soured due to accidental delay between making and freezing. None of the pies had been distributed, and the owner voluntarily destroyed the lot when he learned of their condition. Many people could have been made seriously ill if these pies had left the plant.

In the poultry and rabbit program the Food and Drug Administration is concerned with keeping diseased poultry and rabbits out of food channels. As a matter of fact, in all of the food programs, the agency is concerned with possible routes of contamination and hence possible vectors of infection as well as the adequacy of processing to prevent both the transmission of disease organisms and spoilage of the food which might cause illness.



Somewhat closer to the interests of the proprietary drug industry is the program of checking on the enrichment of staple foods with vitamins and minerals to insure that these foods contain the full amount of these essential food elements. Also there is the dietary food program designed to insure adequate labeling of these foods to protect the health of diabetics, hypertensives, and others with special dietary requirements. Recent labeling regulations for low sodium foods and the vitamin testing activities carried on by the Division of Nutrition illustrate the health significance of the work done in this area.

The basic requirements of the Federal Food, Drug, and Cosmetic Act with respect to drugs may be summarized as safety, effectiveness, and correct labeling. Obviously, these are closely related to each other. Safety means safety for use according to the directions given on the label or recommended to the physician. Efficacy means effectiveness for the conditions for which the drug is offered or recommended. Obviously, a drug which lacks the potency declared on its label, or is otherwise ineffective, may be unsafe, particularly if used for serious illness.

One of our serious public health problems is reliance upon ineffective remedies and treatments promoted by quacks and charlatans, some of whom masquerade as scientific authorities. The Food and Drug Administration can deal with only one aspect of this broad problem by enforcing the law against interstate shipment of quack remedies and worthless devices.

### The Drug Field

Some of the many programs in the drug field are concerned especially with the adequacy of controls over the compounding and labeling of drugs. The wrong ingredient or the wrong label can have disastrous consequences. So can the accidental contamination of drugs or the lack of sterility in products whose use requires them to be sterile. Sometimes in the interest of public health and safety it becomes necessary to clear the market of a drug that is dangerous because it is defective or misbranded. During the past fiscal year there were 32 such episodes. In all of these, fortunately, the records of the

manufacturer were found adequate to trace all shipments, and it was not necessary to issue public warnings. In most instances the drug firms themselves were the first to notify the Food and Drug Administration when adverse reports were received regarding one of their products.

The law, of course, contains the multiple seizure provision in section 304(a) which enables the Government to remove from the market products which the courts have found to be adulterated or misbranded or, as the law says, "when the Secretary has probable cause to believe . . . that the misbranded article is dangerous to health, or that the labeling of the misbranded article is fraudulent, or would be in a material respect misleading to the injury or damage of the purchaser or consumer." This section is obviously of great importance from a public health standpoint since it enables the Government to act effectively when the shipper of the goods is unwilling or unable to correct a violation.

Distribution of new drugs before their safety has been established pursuant to section 505 is an offense that is rarely encountered. When it is considered that the ten-thousandth new drug application became effective in June 1955, it is clear that the last 15 years have seen an outstanding advance not only in medical research but also in drug regulation for the protection of public health. It is particularly fortunate that many high-powered therapeutic agents discovered during this miracle drug era have been restricted to use under medical supervision. At the same time as experience is gained, it is found that some of these new drugs can be safely used by the layman. When that is the case the law requires that such drugs be labeled with adequate directions for such use. Recently, a definite procedure has been established for making this change in the status of a new drug. This regulation provides for public notice of such changes, allowing an opportunity for interested persons to state their views regarding the proposed change.

Among many other health responsibilities is the testing and certification of coal-tar colors to insure their harmlessness and suitability for use in food, drugs, and cosmetics. The testing and certification of insulin is vital to health because of the necessity for precise dosage in the use of this drug.



Antibiotic drugs, which are administered to millions of persons for prevention or treatment of serious diseases, are likewise tested and certified by the Food and Drug Administration, thus guaranteeing to manufacturer, physician, and patient that they were safe and fully effective when they left the manufacturer's establishment.

There is the sampling and testing of such therapeutic devices as surgical sutures for required tensile strength and clinical thermometers for correct readings.

The cosmetic program is directed primarily toward protection of health. FDA investigates particularly cosmetics which may be dangerous—those containing new ingredients, the safety of which may not be fully established, or those misbranded by seriously misleading claims.

Then there is the enforcement program against the illegal sale of prescription-legend drugs by pharmacists and others, especially such habit-forming and dangerous drugs as the barbiturates and amphetamines.

Enforcement of the Caustic Poison Act is another of FDA's health responsibilities. The poison label and antidotes on certain household chemicals have helped greatly to reduce the toll of injuries and accidental deaths of children. I have been glad to learn of the interest the proprietary industry is taking in educating the public against carelessness in the use and storage of common household remedies. Many people seem to be oversold regarding the complete safety of some of these products, and they leave them where they can be readily sampled by young children.

### New Problems

This discussion would not be complete without consideration of new health problems involving foods and drugs. Some of these are with us now. Others loom on the horizon and must be anticipated by study on the part of both Government and industry.

Only a few weeks ago several thousand commercial packages of foods were exposed to an atomic explosion at the Nevada proving grounds. Similar tests on drugs have already been made and reported. The tests are made,

of course, to learn what protection is provided by packaging and other factors against radioactive contamination. FDA already has considerable experience in this field and is conducting a series of training courses for State and local health workers to prepare them for their responsibilities in this area of civil defense.

An FDA Food Industry Advisory Committee, named by the National Research Council, is collaborating in studies of the vulnerability of food-processing plants to atomic, chemical, and bacterial warfare attack, and likewise of the decontamination measures needed in the event of such attack.

But civil defense is not FDA's only concern with regard to atomic energy. Radioactive drugs are becoming of increasing importance, and the radiation sterilization of foods is now the subject of intensive research by other Government and private organizations. FDA is not as active in this general area as it should be considering its health responsibilities. Similarly, such new developments as the increasing employment of hormones and other potent drugs in livestock feeds, the increasing use of chemical additives in commercial food processing, and the proposed use of antibiotics as food preservatives demand that FDA's research facilities be expanded so that adequate attention will be given to the health side of these new developments.

We cannot consider the health responsibilities of the Food and Drug Administration without being impressed by the tremendous size of the job which this organization tries to accomplish. And when we consider the size of the organization—around 800 people working on enforcement operations, about 200 of them available for inspection work—we wonder how they do it. The fact is, of course, that they have been able to do only a partial job. For example, in 1954 they were able to inspect about 10 percent of the approximately 96,000 plants and warehouses which do a substantial interstate business in food, drugs, or cosmetics. At that rate each plant would be inspected about once in 10 years.

This obvious discrepancy between the size of the job and the facilities for the job led to the appointment of the Citizens Advisory Committee on the Food and Drug Administration.

This committee of 14 distinguished, public-spirited citizens, financed by a special appropriation of Congress, has made a thorough investigation.

Based on its findings, the committee has recommended a substantial increase in the facilities and staff of the Food and Drug Administration to be accomplished in a period of 5 to 10 years.

The committee also recommended much greater emphasis on use of the techniques of trade and public education to accomplish the objectives of the law. For example, it recommended action to inform the public in specific terms against quackery, especially where real hazard to health is involved. To promote

understanding of the prescription requirements of the law, the committee recommended that more effective means be found for educating physicians and pharmacists concerning these requirements and for developing mutual understanding between them and the public. Finally, it recommended increased representation of the Food and Drug Administration at meetings of State and local food and drug or health officials.

If these and other recommendations of the citizens committee can be carried out, I am sure there will be better understanding of the role of the Food and Drug Administration as a public health agency and better cooperation by all who are concerned about the effective enforcement of our pure food and drug laws.

## Poliomyelitis Vaccination Assistance Funds

Funds have been allotted to each State under the \$30 million Poliomyelitis Vaccination Assistance Act signed by President Eisenhower August 12, 1955.

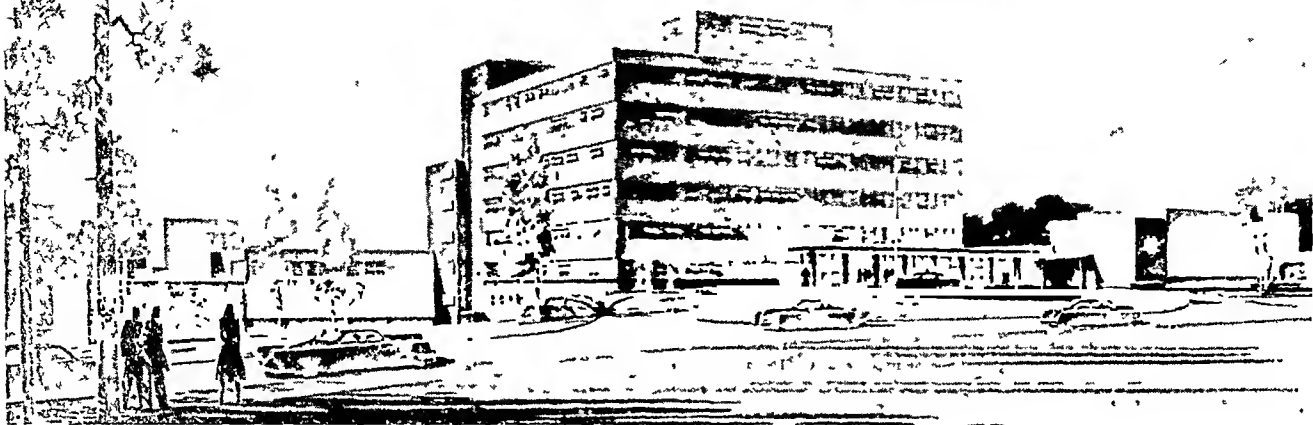
The law apportions the money in accordance with a formula which considers the number of unvaccinated children under age 20 and expectant mothers in each State, the relative per capita income of the State, and the per capita cost of vaccine. Of the \$30 million appropriated by Congress, \$25 million is available only for the purchase of vaccine, and \$5 million may

be used for the costs of planning and conducting poliomyelitis immunization programs or for the purchase of vaccine. The funds are to be used by February 15, 1956.

While the vaccine may be administered by private physicians and by nonprofit organizations as well as by public agencies, the law provides that in vaccination programs conducted by public agencies no "means test" may be used to limit eligibility. Persons who are under 20 or are pregnant are eligible.

<i>State</i>	<i>Allotment</i>	<i>State</i>	<i>Allotment</i>	<i>State</i>	<i>Allotment</i>
Alabama.....	\$986, 907	Massachusetts.....	\$686, 853	South Dakota.....	\$156, 769
Arizona.....	209, 167	Michigan.....	1, 007, 656	Tennessee.....	863, 814
Arkansas.....	646, 637	Minnesota.....	593, 448	Texas.....	1, 714, 995
California.....	1, 597, 864	Mississippi.....	917, 196	Utah.....	166, 281
Colorado.....	240, 586	Missouri.....	661, 848	Vermont.....	78, 718
Connecticut.....	246, 065	Montana.....	115, 672	Virginia.....	768, 384
Delaware.....	42, 118	Nebraska.....	245, 862	Washington.....	381, 315
District of Columbia.....	100, 608	Nevada.....	25, 541	West Virginia.....	488, 270
Florida.....	677, 027	New Hampshire.....	88, 295	Wisconsin.....	610, 539
Georgia.....	992, 329	New Jersey.....	644, 386	Wyoming.....	56, 069
Idaho.....	138, 225	New Mexico.....	201, 754	Alaska.....	77, 240
Illinois.....	1, 133, 062	New York.....	1, 727, 103	Hawaii.....	100, 359
Indiana.....	640, 435	North Carolina.....	1, 257, 807	Puerto Rico.....	1, 169, 790
Iowa.....	490, 128	North Dakota.....	160, 718	Virgin Islands.....	10, 911
Kansas.....	361, 222	Ohio.....	1, 167, 501	Canal Zone.....	15, 702
Kentucky.....	800, 637	Oklahoma.....	489, 949	Guam.....	22, 751
Louisiana.....	764, 696	Oregon.....	269, 842	American Samoa.....	12, 758
Maine.....	200, 910	Pennsylvania.....	1, 570, 896		
Maryland.....	385, 123	Rhode Island.....	115, 211		
		South Carolina.....	701, 198	Total.....	\$30, 000, 000

# New Home for Communicable Disease Center



By THEODORE J. BAUER, M.D.

NEW headquarters for the Public Health Service Communicable Disease Center has been authorized by Congress, and construction is expected to begin as soon as financing and construction bids are approved. Site of the new facilities is a 14-acre plot donated by Emory University and located adjacent to its campus in suburban Atlanta, Ga. The headquarters will consist of six separate buildings grouped together and interconnected.

The Communicable Disease Center is a division of the Bureau of State Services. CDC attacks the problem of communicable diseases by conducting investigations and demonstrations, providing training, offering consultation, and giving epidemic and disaster aid to State and local health departments. The center came into being in 1946 when its predecessor, the Office of Malaria Control in War Areas (MCWA), was terminated following the close of World War II.

MCWA began its malaria control activities on March 17, 1942, from headquarters in At-

lanta. During its first year, projects were under way, employing more than 2,600 men in 93 areas in 15 States, the District of Columbia, and Puerto Rico. These projects benefited 450 war establishments, including military, industrial, housing, and recreational installations, and afforded protection to several million persons connected with the war effort. In early 1946, MCWA launched an extended program, with a budget of \$12 million and a staff of 4,500 persons.

Housing for MCWA activities was temporary and scattered. Office space was at a premium in the early days of the war. As the organization grew, so did its demand for additional space. Temporary and makeshift facilities did not pose an insurmountable problem for a wartime organization concerned primarily with field operations. However, with the transition to CDC's broad communicable disease control program, the need for space to house laboratory, training, and other pertinent activities became acute. The number of technical and laboratory personnel had increased steadily, while the number of unskilled and skilled laborers and other nontechnical personnel had declined sharply.

The new headquarters will provide the facili-

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*Dr. Bauer is chief of the Communicable Disease Center, Public Health Service, Atlanta, Ga.*

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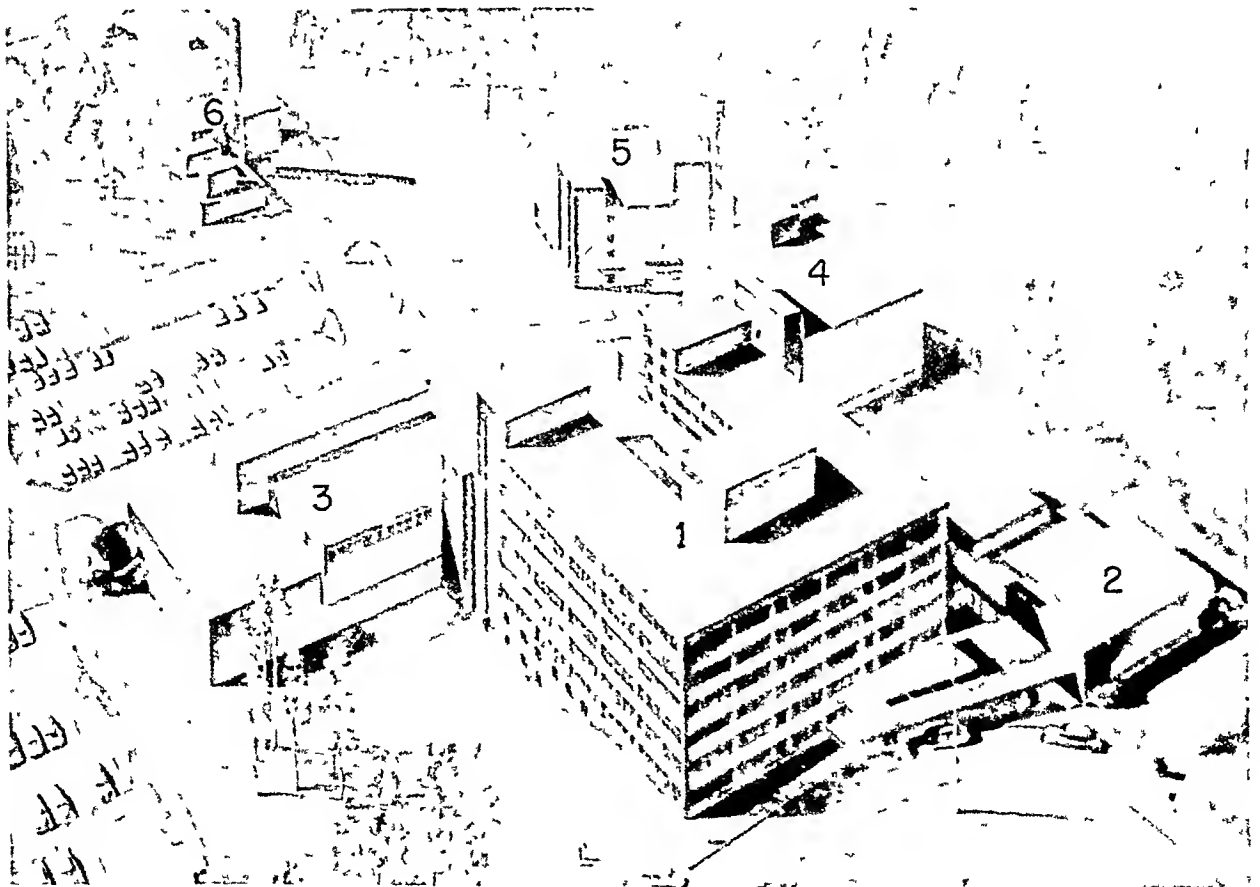
ties needed. In the main building, ① in the sketch, with a net area of 105,014 square feet, a broad peripheral area devoted to office space will rise 5 stories high, while the central portion which it bounds will be 4 stories high. The outer area will provide space for training facilities and for personnel who perform administrative and other services essential to support of the operating branches; the central area is to house research and training laboratories. The training facilities will consist primarily of lecture rooms and demonstration laboratories to be located back to back with a projection booth between. Lounge-reading rooms in this area will be readily accessible for use by all lecture and laboratory groups.

The auditorium and cafeteria, ②, will be in a 2-floor building designed to provide facilities convenient for both employees and visitors to the center. The auditorium will be adequate for large classes and conferences, and the cafeteria will offer accommodations for the regular staff, as well as for trainees and guests. In addition,

there will be a lobby, a kitchen, and a service area. The net area for this structure is to be 7,482 feet.

The audiovisual services buildings, ③, will be a 4-floor structure designed to accommodate the specialized equipment and operational processes used in the production and distribution of motion pictures, filmstrips, exhibits, and other visual or audio materials. This building will house a sound stage for indoor production; a soundproof recording room, and a photomicrographic studio protected against vibration; facilities for film processing, printing, and editing; a film distribution center; and a training area with adequate flexibility to meet the increasing demand for training in the production and utilization of films. Total area of the audiovisual services building is to be 25,407 square feet.

It was imperative to plan for space apart from the main building where studies requiring the handling of highly infectious materials could be pursued. Two buildings, ④ and ⑤,



were designed to meet this need: the virus building and the infectious disease building. Each is planned to provide maximum safety for workers within the building and to minimize the potential hazard to others at CDC.

The infectious disease building, to contain 5 floors, will be situated apart from the main building but connected to it by open corridors at each floor level. It is designed to house laboratories for studies on infectious diseases other than viral and to provide quarters for experimental animals required in this work. Here, also, special studies on potential agents of biological warfare will be conducted. A net total of 14,836 square feet of space is provided for laboratories, 7,255 square feet for animal quarters, and 5,246 square feet for central services.

The virus building will be a 5-floor structure also, and is designed to house the bulk of the Virus and Rickettsia Section laboratory activities including reference diagnostic work, training, consultation, and methodology research. It provides a net total of 27,937 square feet of space for these activities.

The power house, ⑥, will be located apart from the other five buildings. It will house a gas-fueled central heating system and equipment to provide hot water, distilled water, com-

pressed air, and refrigeration. Its 2 floors will contain a gross area of 10,580 square feet. Storage will be provided for a supply of oil to be used in case of temporary failure of the gas supply and for electrical generators as a source of power in case of failure in the regular supply.

All of the buildings will be air conditioned, and adequate parking space on the grounds will be provided for employees and visitors.

Utilization of space in the buildings has been planned to meet the need for versatility posed by varied activities associated with communicable disease control. Animal space and much of the office space can be converted for use as laboratories if necessary. The buildings can be expanded without disruption of activities. This includes vertical extension of the central laboratory portion in the main building and the addition of an office wing.

The construction of these buildings will allow the CDC, for the first time, to assemble its headquarters activities at one location. Now they are located in some 65 buildings in Atlanta and Chamblee, Ga., and at Montgomery, Ala. Many of these buildings are temporary structures, unsuitable for laboratory work, and expensive to maintain.

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## Air Pollution Control Act

An Air Pollution Control Act, approved by the President July 14, 1955, provides for a 5-year \$25 million Federal aid program in this field.

The law also authorizes an annual appropriation of \$5 million to the Department of Health, Education, and Welfare for administering the law and for grants-in-aid to State and local government air pollution control agencies and to other public and private agencies and individuals for research, training, and demonstration projects.

The provisions encompass the development of methods for eliminating or reducing air pollution, surveys of specific air pollution problems upon request of State or local air pollution control agencies and recommendations for their solution, and collection and dissemination of information useful in combating or preventing air pollution.

| *One of the youngest of the voluntary national health agencies, United Cerebral Palsy, is making a fight against the crippling condition that affects more than half a million people in the United States today.*

# United Cerebral Palsy

—*Its Growth and Present Status*—

By GLIDDEN L. BROOKS, M.D., and ISIDORE ALTMAN, Ph.D.

CEREBRAL PALSY has been defined by Phelps as "comprising a group of conditions which affect the control of the voluntary motor system and which have their origin in lesions of various parts of the brain" (1). Among the more common clinical signs are lack of balance, awkward posture and gait, uncontrollable movements of the arms or legs, and impaired speech, hearing, and vision. At least half of all cases also suffer some degree of impairment of mental capacity. In addition, disturbances of perception may be present.

The nature and extent of the disability depend on the location and the extent of the damage to the brain. The damage may occur before, during, or after birth, or subsequently as the result of a head injury, encephalitis,

poisoning, or other brain-injuring situation. However, the great majority of the cerebral palsied sustain brain injury during the prenatal or paranatal period. Among the likely etiological factors are anoxia, brain hemorrhage, prematurity, blood incompatibility (Rh factor), and malformation of the brain.

The precise incidence and prevalence of cerebral palsy remain to be established. Estimates based on the few scattered surveys that have been made indicate that the prevalence rate is approximately 3 to 3.5 cases per 1,000 population and that there are about 570,000 cases in the United States today. The Children's Bureau has estimated that "somewhere in the neighborhood of 285,000 children under 21 in the United States in 1952 have cerebral palsy either from birth or as a result of subsequent brain damage" (2).

Cerebral palsy presents many more kinds of problems than just those of medical care. It presents special problems in the fields of education, psychology, vocational guidance and training, and recreation. Because of the involved relationships between parent and afflicted child, programs are also needed for family education and counseling. An added problem is the provision of transportation and

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*Dr. Brooks has been medical director of United Cerebral Palsy Associations since 1953. Prior to that, he was coordinator of hospital clinics and professor of hospital administration of the Graduate School of Public Health, University of Pittsburgh. Dr. Altman is assistant professor of biostatistics of the Graduate School and statistical consultant of United Cerebral Palsy.*

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its attendant costs, for many of these children could not otherwise be moved to and from their various activities.

### **The Associations**

United Cerebral Palsy Associations, Inc., came into being in 1949. The reasons for its existence and for the existence of similar organizations have been ably expressed by Courville (3): "A new trend in the attack on disease, one introduced even before the beginning of World War II, is the association of lay and professional groups in an attempt to answer the questions posed by some particular disorder. The lay representatives owe their interest as a rule to the fact that some member of their own family is a victim of the disease in question. The professional groups are those whose special training or interests naturally incline them to its study. It is this common concern for the social as well as the medical effects of a given condition which unites the two groups in seeking a solution to the problem."

United Cerebral Palsy was founded through the efforts of parents of the cerebral palsied. On April 1, 1954, it had 356 affiliates, with affiliates in all States and the District of Columbia. It has grown, in terms of contributions from the public, from an organization with an initial income in 1950 of \$1,022,000 to one with an income in 1954 of \$8,242,000.

### **Autonomous Affiliates**

The local affiliates are autonomous, raising their own funds and expending these funds as they see fit, except that 25 percent of their income is used for participation in the national program. It is they who assume the responsibility for seeing that services are provided for cerebral palsied persons who live in their communities. State offices have been established in a number of States mainly for the purpose of stimulating and coordinating local activity. These are supported by locally determined percentages of income, generally about 5 percent. The national office promotes the growth of the organization, provides specialists for advice and assistance to local affiliates in the development of services, fund raising, public relations, and

legislation, and fosters a research and training program through grants.

The objective of a local affiliate is to make certain that the needs of the cerebral palsied are being met. This means mobilization of community resources through financial support of agencies providing some of the services, seeking legislation for services that government should provide, case finding and evaluation of resources, and the actual establishment and operation of facilities where this is deemed the most effective means of providing services.

### **A Selected Local**

Because United Cerebral Palsy is still a rapidly growing organization and because size and growth of program vary considerably from community to community, it is difficult to assess the success with which the objective just stated is being achieved. Instead of a nationwide examination, the activities of one of the older affiliates will be described as indicative of the trends in the development of affiliate programs.

The selected local United Cerebral Palsy agency made a total expenditure of \$70,000, in round figures, for services in the year ending June 30, 1954—\$24,000 for medical services, \$35,000 for education, \$5,000 for recreation, \$1,000 for parent education and counseling, and \$5,000 for transporting cerebral palsied persons to places where they could receive these services.

The medical program to which the affiliate contributed \$24,000 is administered by a children's hospital connected with an outstanding medical school. Its cerebral palsy unit provides screening for purposes of diagnosis and all the facilities and personnel necessary to speech, occupational, and physical therapy. During the year, 267 patients were served on an outpatient basis; of these, 129, or 48 percent, were under 5 years of age. It is important to successful prognosis that the child be brought to treatment as early as possible.

The funds for education were devoted largely to the maintenance of a nursery school, with 28 children, in the medical center mentioned above. The \$20,000 contributed by the affiliate made up a fifth of the nursery school's total budget. Another \$10,000 went for educational purposes in

a hospital devoted to the rehabilitation of handicapped children. The remaining \$5,000 helped to maintain an industrial school for crippled children, which last year had 43 cerebral palsied enrollees.

Recreational activities consist in bringing children to a center one day a week for games, art work, and even dancing. One of the notable achievements of this particular affiliate is the formation of a choral group made up of cerebral palsied adults. Other affiliates contribute to the general support of summer day camps and residential camps or meet the costs for a number of cases.

Parents meet at bimonthly intervals to hear authorities speak on various aspects of cerebral palsy. In addition, individual counseling is provided on social and health development of the child and on such specific problems as feeding, dressing, and exercising. The parents themselves contribute a considerable amount of voluntary services in raising funds, furnishing transportation, taking the children on outings, and the like.

While this local organization incurred no expenditures for services of a vocational nature, cerebral palsied adults have been placed in employment or for training through consultation with rehabilitation agencies and workshops in the community. A number of affiliates of United Cerebral Palsy maintain sheltered workshops where training and jobs are provided to fit the capacities of the handicapped individual, while other affiliates provide counseling or offer vocational services.

Thus, the affiliates of United Cerebral Palsy make a contribution to public health progress through the active support of diagnostic and treatment centers and other services to alleviate a handicapping condition which is costly to the community, both economically and socially. They make a further contribution through support of a research program which seeks to find the causes of cerebral palsy and thereby to prevent it.

### The National Office

The function of promoting research and the training of professional personnel, on the whole, is vested in the national office. The

method followed in making research grants is patterned for the most part after the system developed by the National Institutes of Health. Applicants for grants must have a university affiliation or be connected with some other responsible and recognized institution to which the money is actually paid. Applications are received and rated by a research advisory board made up of distinguished neurologists, surgeons, pediatricians, and specialists in other fields related to cerebral palsy. A medical executive board reviews the recommendations of this and other advisory boards and makes final recommendations to the lay governing body. Up to September 30, 1954, United Cerebral Palsy has spent almost \$1,400,000 for its research and training program.

To date, the emphasis of this program has been mainly on basic neurological research, oriented toward the goal of prevention. The number of grants made for research into problems of education, social development and adjustment, and mental status is expected to increase. Research projects currently under way fall into five broad groups of studies:

1. The physical structure of the normal and damaged brain.
2. The chemical structure of the normal and damaged brain.
3. The function of the normal and damaged brain.
4. Causes of brain damage.
5. The nature and characteristics of the cerebral palsied.

The training program consists of (a) direct grants to the American Physical Therapy Association and the American Occupational Therapy Association for training recruits in their respective fields; (b) summer workshops for teachers and therapists at eight colleges and universities; (c) fellowships for dentists and dental hygienists; (d) support of postgraduate courses for therapists; and (e) miscellaneous training programs.

The program division of the national office, which is charged with developing principles of program services and with general supervision of the research and training grants, carries on active liaison with other national agencies in such related fields as public health, education, and rehabilitation. It is represented on com-



mittees and boards of the National Health Council, American Public Health Association, International Council for Retarded Children, American Occupational Therapy Association, and other similar organizations. United Cerebral Palsy recognizes full well that it will take the concerted efforts of many national agencies, in cooperation with government, to conquer the disorder in which it is particularly interested.

### One of a Group

United Cerebral Palsy is now one of a group of prominent voluntary national health agencies which perform an important function in public health. By concentrating on a single disorder or group of disorders, these associations can provide or support a high level of service and bend special efforts toward ultimate eradication. In the community, they bring together a devoted group of lay and professional people in a dedicated cause.

As for cerebral palsy specifically, Surgeon General Scheele, in addressing the 1954 convention of United Cerebral Palsy, had this to say: "It is an old public health axiom, proved seventy times seven, that however massive and complex a problem may be, it will eventually be

solved by attacking its various elements one by one. The success of the attack depends upon the breaking down of the broad problem into a series of research problems and solving them. This approach is especially valuable in the attack on cerebral palsy . . .

"The idea of preventing a large share of the cases of cerebral palsy now occurring each year may seem like a dream. But I believe that it is a distinct possibility. I believe too that medical research is on the threshold of other important discoveries that will greatly improve the status of many victims of cerebral palsy. Only through persistent research effort in the many specific areas of cause and prevention, treatment and rehabilitation can we truly vanquish this enemy that causes so much heart-break and suffering."

### REFERENCES

- (1) Phelps, W. M.: The cerebral palsies. In Mitchell-Nelson textbook of pediatrics. Ed. 4. Philadelphia, W. B. Saunders Co., Philadelphia, 1946, p. 1111.
- (2) Lesser, A. J., and Hunt, E. P.: The Nation's handicapped children. *Am. J. Pub. Health* 44: 166-170, February 1954.
- (3) Courville, C. B.: Cerebral palsy. Los Angeles, San Lucas Press, 1954, p. 1.

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## Scholarships in Cancer Research

The National Research Council's Committee on Growth is accepting applications for American Cancer Society grants to assist young scientists during the critical early period of their careers in cancer research.

Awards are made for 3-year periods at \$6,000 annually with possible renewal for 2 additional years. Applications should be submitted by institutions on behalf of candidates not later than January 1, 1956. Forms and information may be obtained from the Executive Secretary, Committee on Growth, National Academy of Sciences-National Research Council, 2101 Constitution Avenue, N.W., Washington 25, D. C.

# Occurrence of Influenza July 1954 to June 1955

BY DORLAND J. DAVIS, M.D., DR.P.H.

**S**PECIFICALLY diagnosed influenza has been reported to the Influenza Information Center of the World Health Organization Influenza Study Program in the United States since 1948. This information comes from investigators and diagnostic laboratories located in universities, hospitals, and Federal and State agencies, including Army, Navy, and Air Force installations. The weekly summaries of these reports and those received from other countries are published in the Communicable Disease Summary of the National Office of Vital Statistics, Public Health Service, and distributed to health officials and interested research workers in the United States and other countries. As part of the worldwide effort sponsored by the World Health Organization, this program seeks to improve the reporting of influenza and the exchange of newly isolated strains of influenza virus for investigational purposes. The present communication will consider the experience in the United States in the period July 1954 to June 1955.

During the previous winter season, 1953-54, influenza was almost totally absent from the

United States and Western Europe. In the year before that, 1952-53, influenza A occurred in epidemic proportions in the United States, principally in the midwest and the south, with a small but noticeable concurrent increase in mortality rates. During the late winter of 1951-52, influenza B occurred widely in the United States in localized outbreaks with no appreciable fatality rate. In the season before that, 1950-51, there were epidemics of influenza A in the United States, particularly the northeastern part, which had been preceded by sharp outbreaks in England and Western Europe.

Influenza was reported during the winter months of this last year, 1954-55, in scattered areas of the United States, particularly the eastern seaboard, and was almost exclusively due to type B virus. The first suggestion of influenza came from New York State during the third week of December, with an outbreak of influenza-like respiratory disease in a school. During the first part of January, high rates of absenteeism due to illness were noted in junior and senior high schools in Washington, Norfolk, Boston, and other cities of the eastern seaboard. The clinical features of the illness were of short duration and resembled influenza. Virus isolation and serologic studies later showed that many, if not the major proportion of cases, were due to influenza B.

The first reported isolation of influenza B virus in the country was from an unvaccinated patient at the Great Lakes Naval Training Station, Ill., whose onset occurred during the last week of December. This strain was antigenically similar to the strain recovered the previous year at the same installation. Influenza B continued during January in the eastern part of the country, and scattered reports of localized outbreaks were received from the midwest. In military installations, the rate of respiratory diseases remained relatively low, but cases of influenza, principally type B, were diagnosed serologically and by virus isolation at a number of posts throughout the United

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*Dr. Davis is executive secretary of the Influenza Information Center, WHO Influenza Study Program in the United States, National Institutes of Health, Bethesda, Md. He is also chief of the Laboratory of Infectious Diseases, National Microbiological Institute of the Public Health Service. In the December 1954 issue of Public Health Reports, Dr. Davis discussed the occurrence of influenza for the period July 1953 to June 1954.*

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## Specimens for Influenza Diagnosis

The specific diagnosis of influenza type A, B, or C can be made only by laboratory examination.

The laboratories collaborating in the Influenza Study Program have facilities for specific diagnosis. Their locations may be obtained from State and Territorial health departments or from the Influenza Information Center, National Institutes of Health, Bethesda 14, Md.

The two most commonly used methods are specific isolation of the virus and demonstration of a rise in specific antibody by the hemagglutination inhibition test or the complement fixation test.

Samples for virus isolation should be obtained as early as possible in the acute phase of illness by collecting throat washings or throat swabs in a small amount of sterile bacteriological broth, skim milk, or serum-saline solution. These samples should be frozen at low temperatures unless taken to the laboratory within a few hours.

Two consecutive serum samples (drawn from a minimum of 5 cc. of blood) are necessary for serologic diagnosis. Single samples are of no value. The first sample should be taken as early as possible during the illness and the second about 14 days after onset. Separate serum is desirable. Clotted whole blood may be forwarded if time of transit is short, but it must not be frozen.

All such specimens should be sent to the nearest collaborating laboratory.

States. Influenza vaccine had been administered routinely to all military personnel early in the winter season.

In early February, reports continued of outbreaks, particularly among junior and senior high school students, and a number of colleges reported high incidence of respiratory illness, which later was shown to be due to influenza B virus. The disease was reported in Maine, Michigan, the southwestern States, California, and Oregon, and must be presumed to have occurred in many other States. In some areas such as Michigan, isolated cases of influenza B were diagnosed without the recognized occurrence of sharp outbreaks during this same period. Although in most areas of the country the incidence declined in the latter part of

February, cases continued to be diagnosed in some areas, including California, during March, April, and May.

For the first time in 2 years, influenza A virus was recovered from a patient in a New York State institution, with onset on March 1. Shortly thereafter, influenza A virus was also recovered in another institution in New York, and complement fixation tests on paired serums identified three other cases of influenza A in the same institution, having onsets in the middle of March. In April, additional cases of influenza A were diagnosed serologically in New York and California, and sporadically in military installations. No other isolations of influenza A virus were reported during the remainder of the July 1954-June 1955 period.

Influenza C was recognized serologically in areas where special effort was made to diagnose it, and one isolation was reported, but there was no evidence that it was a cause of epidemic respiratory disease.

### Isolations of influenza virus and positive diagnostic serologic tests (any technique) reported by civilian and military laboratories participating, continental United States and Alaska

Month and year	Isolation of virus, type			Positive serologic tests, type		
	A	B	C	A	B	C
1954						
December-----	0	1	0	2	38	6
1955						
January-----	0	83	0	9	100	4
February-----	0	68	1	14	108	3
March-----	3	9	0	12	121	3
April-----	0	0	0	7	33	4
Total-----	3	161	1	44	400	20

The table shows a total of 629 reports of both virus isolations and serologic diagnoses of influenza from all the cooperating laboratories, including military laboratories, and gives a rough indication of the prevalence of the disease in the winter months. A total of 161 strains of influenza B, 3 strains of influenza A, and 1 strain of influenza C were isolated, and 400 positive diagnostic serologic tests for influenza B, 44 positive serologic tests for influenza

A, and 20 positive serologic tests for influenza C were reported.

Reports from the World Health Organization Headquarters, Geneva, the Canadian WHO Influenza Information Center, and from the World Influenza Center, London, indicated that influenza B began to occur sporadically in northern England and Wales in November and continued during December and January. In January, influenza B outbreaks were occurring in Canada, northern Holland, and later in the month, in Germany and Yugoslavia. As in the United States, the disease attacked principally school children. In February, WHO reports indicated continued outbreaks of influenza B in Europe, including Finland, and in different parts of Japan, particularly Tokyo. In March and April, influenza A infections were recognized serologically and by virus isolation in several widely separated areas of Great Britain, particularly southern Wales. It is of interest that the experience with influenza infections was similar in the United States, Canada, and Western Europe. Briefly, this was the occurrence of scattered outbreaks of influenza B, sometimes of considerable intensity, occurring chiefly among school children, beginning in the early winter and continuing

through February. In March, a few influenza A infections were recognized in both Great Britain and the United States, the first due to this type in 2 years.

Antigenic studies at several laboratories showed that the isolated strains of influenza B were similar to each other and very close to the B/GL/1/54 strain isolated in the Great Lakes Naval Training Station in March 1954. They differed somewhat from those isolated in 1950-52 and even more from the B/Lee strain of 1940. Preliminary antigenic analysis of the influenza A strains recovered in this country and Europe indicate general similarity to each other but also some variation from those recovered in previous years. Detailed studies are being undertaken to define more precisely the antigenic patterns of these recently recovered strains in the expectation that they may be important during the coming year.

Data collected by the National Office of Vital Statistics reveal that the number of deaths ascribed to influenza and pneumonia increased moderately in February, but most of this may be regarded as the usual seasonal increase in deaths from respiratory disease. The total mortality rate during the winter months was not noticeably increased.

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## Veterinarians' Entrance Salaries Raised

All Federal agencies were authorized last month to increase the starting salaries of grade GS-7 professional veterinarians from \$4,930 to \$5,200 annually. Veterinarians already employed at this grade will receive a minimum of \$5,200 a year.

The United States Civil Service Commission acted under legislation authorizing Federal recruitment at above minimum rates for particular jobs in areas in which the Federal Government is at a competitive disadvantage with private industry. The action became effective October 23, 1955.

Study by the Civil Service Commission revealed that \$5,200 a year more nearly approximates the salaries offered by non-Federal employers at the entrance level than the starting salary authorized by the Commission last June.

# Effect of Topical Fluorides On Teeth Matured on Fluoride-Bearing Water

By DONALD J. GALAGAN, D.D.S., M.P.H.,  
and JACK R. VERMILLION, B.S., M.P.H.

EARLIER STUDIES have been concerned with the effect of topically applied fluorides on dental caries experience in the permanent teeth of children in areas with fluoride-free water supplies (1-7). These investigations demonstrated that four applications of a 2-percent solution of sodium fluoride to the teeth of children not previously exposed to fluoride reduce the incidence of new caries in sound teeth by 40 percent.

The effect of topical fluoride therapy on teeth matured on fluoride-bearing water has not been thoroughly explored. There is a single report in the literature suggesting that topically applied fluorides do not influence caries experience in such teeth (8). Therefore, a study was designed to test further the caries inhibiting effectiveness of a 2-percent sodium fluoride solution applied directly to teeth of children continuously exposed to water having an optimum concentration of fluoride.

The study was conducted in Tucson, Ariz., from January 1953 to April 1954. The water supply in the southside section of Tucson contains 0.7 p.p.m. fluoride, an optimum concentration for the particular climatic and environmental conditions existing in south central

Arizona (9, 10). In the southside section there is a fairly large school population from which to draw continuous residents with a common history of exposure to fluoride-bearing water.

The application technique developed in earlier Public Health Service studies was used in this test (11). In alternate children, teeth in the right quadrants were treated four times with a 2-percent sodium fluoride solution after an initial prophylaxis. The teeth on the opposite side were given four applications of tap water at the same sitting. In the remaining children the teeth on the left side were treated with sodium fluoride, the control teeth with tap water. The children were examined just prior to treatment, and again 1 year later. The treated quadrants were not identified during either examination.

The study group consisted of 350 continuous resident children aged 7 to 16, and equally distributed by sex and age. At the end of the 1-year period, 282 students were available for re-examination. Of these, 142 had been treated on the left side of the mouth and 140 treated on the right side. The results of this study are based on analysis of these 282 children, whose age distribution follows.

Age	Number of children	Age	Number of children
7	10	12	33
8	39	13	30
9	38	14	15
10	44	15	22
11	47	16	4

A summary of the incremental dental caries during the study year is presented in the table. Ninety-two of the 2,342 noncarious treated teeth and 101 of the 2,324 noncarious untreated teeth became carious during the year. The observed difference shows a 9 percent lower caries incidence in the treated teeth. However, this difference is within the limits of chance variation and might have occurred had the children been given no treatment at all.

The data presented here neither confirm the

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**Dental caries experience during the study year in fluoride-treated and untreated permanent teeth and percent less new caries experience in fluoride-treated teeth of 282 school children in Tucson, Ariz.**

Mouth quadrants	Noncaries teeth, April 1953	New carious teeth, April 1954	Percent less new caries experience in treated teeth
<i>Upper jaw</i>			
Treated.....	1, 207	48	7.7
Untreated.....	1, 199	52	
<i>Lower jaw</i>			
Treated.....	1, 135	44	10.2
Untreated.....	1, 125	49	
<i>Both jaws</i>			
Treated.....	2, 342	92	8.9
Untreated.....	2, 324	101	

previous finding (8) nor indicate that topical fluoride applications are effective when used on teeth matured on fluoride-bearing water, since the 9-percent reduction demonstrated may be attributable to chance variation. Further study of greater numbers of children is indicated before any conclusions can be drawn.

An unusually large number of children are required to demonstrate significant changes in caries experience in fluoride areas where caries activity is already low and the potential for caries prevention is small. It would be possible to demonstrate statistical significance of a 9-percent incremental difference between treated and untreated teeth if it were observed in a minimum of 2,900 Tucson children. It will be difficult to determine precisely the effect of topically applied fluorides on teeth matured on fluoride-bearing water until a fairly large community has had a fluoridated water supply for 15 years or longer.

**REFERENCES**

- (1) Knutson, J. W., and Armstrong, W. D.: The effect of topically applied sodium fluoride on dental caries experience. Pub. Health Rep. 58: 1701-1715, Nov. 19, 1943.
- (2) Knutson, J. W., and Armstrong, W. D.: The effect of topically applied sodium fluoride on dental caries experience. II. Report of findings for second study year. Pub. Health Rep. 60: 1085-1090, Sept. 14, 1945.
- (3) Knutson, J. W., and Armstrong, W. D.: The effect of topically applied sodium fluoride on dental caries experience. III. Report of findings for the third study year. Pub. Health Rep. 61: 1683-1689, Nov. 22, 1946.
- (4) Knutson, J. W., Armstrong, W. D., and Feldman, F. M.: The effect of topically applied sodium fluoride on dental caries experience. IV. Report of findings with two, four, and six applications. Pub. Health Rep. 62: 425-430, Mar. 21, 1947.
- (5) Galagan, D. J., and Knutson, J. W.: The effect of topically applied fluorides on dental caries experience. V. Report of findings with two, four, and six applications of sodium fluoride and of lead fluoride. Pub. Health Rep. 62: 1477-1483, Oct. 10, 1947.
- (6) Galagan, D. J., and Knutson, J. W.: Effect of topically applied fluoride on dental caries experience. VI. Experiments with sodium fluoride and calcium chloride . . . Widely spaced applications . . . Use of different solution concentrations. Pub. Health Rep. 63: 1215-1221, Sept. 17, 1948.
- (7) Knutson, J. W., and Scholz, G. C.: The effect of topically applied fluorides on dental caries experience. VII. Consolidated findings for four study groups. Pub. Health Rep. 64: 1403-1410, Nov. 11, 1949.
- (8) Downs, R. A., and Pelton, W. J.: The effect of topically applied fluorides in dental caries experience on children residing in fluoride areas. J. Colorado Dent. A. 29: 7-10, December 1950.
- (9) Galagan, D. J., and Lamson, G. G.: Climate and endemic dental fluorosis. Pub. Health Rep. 68: 497-508, May 1953.
- (10) Galagan, D. J.: Climate and controlled fluoridation. J. Am. Dent. A. 47: 159-170, August 1953.
- (11) Knutson, J. W.: Sodium fluoride solutions: Technic for application to the teeth. J. Am. Dent. A. 36: 37-39, January 1918.

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# Experience of Public Health Workers

By EDWARD M. COHART, M.D., WILLIAM R. WILLARD, M.D.,  
and ERLEEN F. JAMISON, M.P.H.

• Few workers entered public health at the beginning of their careers. About one-fourth had had at least 10 years' experience in other fields before coming into public health. Most commonly such experience was in hospitals and related institutions and in business and industry.

• The most frequent determinants in the choice of a public health career were chance, personal contacts, and the inherent attraction of the work. Only 2 of 595 workers could attribute their choice of this career to formal vocational guidance.

• Laboratory personnel differed from other health department personnel in that a relatively high proportion of them entered public health fortuitously at the beginning of their careers.

• The average health department staff worker had spent 9.2 years in public health. Personnel at higher administrative levels had an average of 14.6 years of public health experience.

• High-echelon personnel felt, to a much greater extent than did staff personnel, that

opportunities to learn about administration and about the community had been their most valuable experiences. Staff personnel stressed opportunities for learning specific techniques.

• Salaries of high-echelon personnel tended to increase with years of experience, except in the medical and administration services. This did not hold true for staff personnel, among whom the worker with long experience not infrequently earned less than his less-experienced co-workers.

These were the findings of the study of the work experience of public health workers that was conducted in the course of the Yale Public Health Personnel Research Project. Such information is one of the foundations for a better understanding of the problems involved in the recruitment and efficient utilization of workers. The findings of the present study cannot be considered conclusive, but they do offer clues for further investigation. Moreover, the study served to demonstrate the application of the method evolved by the Yale project for obtaining knowledge of the public health worker and his job.

Detailed data from the study of work experience are presented in the following pages. The information was secured from more than 600 professional and semiprofessional workers in State and local health departments and visiting nurse associations in Connecticut, Maryland, Michigan, and New York. The sample and the method used were described in the May issue of *Public Health Reports*, pages 447-452.

## Total Work Experience

Ninety percent of public health personnel in high administrative positions (supervisor and

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**Table 1. Duration of total work experience of personnel in State and local health departments<sup>1</sup>**

Administrative level and service	Number supplying information	Percent with stated number of years' experience			
		1-4	5-9	10-19	20 or more
<i>High-echelon</i>					
Medical.....	67	3	4	34	59
Nursing.....	80	1	8	39	52
Sanitation.....	38	0	3	42	55
Laboratory.....	28	4	0	32	64
Administration.....	15	0	27	27	46
Health education.....	8	0	12	50	38
Statistics.....	10	10	10	30	50
Other.....	31	3	6	42	49
<b>Total.....</b>	<b>277</b>	<b>2</b>	<b>7</b>	<b>37</b>	<b>54</b>
<i>Staff</i>					
Medical.....	12	8	25	17	50
Nursing.....	96	16	23	21	40
Sanitation.....	65	11	18	29	42
Laboratory.....	85	32	28	22	18
Health education.....	14	14	14	50	22
Statistics.....	21	14	20	33	33
Other.....	24	17	17	33	33
<b>Total<sup>2</sup>.....</b>	<b>317</b>	<b>19</b>	<b>22</b>	<b>26</b>	<b>33</b>

<sup>1</sup> Includes visiting nurse associations.

<sup>2</sup> Total percentages are only approximations, because the staff-level sample was not equally representative of all services.

higher rank) and 60 percent in staff positions (junior and senior staff) had had at least 10 years' total work experience (table 1). Half of the former and one-third of the latter had worked 20 years or longer.

Length of work experience did not differ materially for personnel in State and local health departments, nor did it differ significantly among the services for high-echelon personnel. At staff-level, however, the members of the laboratory service tended to have had less experience than personnel in the other services. Three-fifths of this group, as compared with one-third of the workers in the other services, had had less than 10 years' experience.

### Experience Outside Public Health

A large proportion of the workers did not enter public health at the beginning of their

careers. Five-sixths of the personnel had worked in other fields (table 2). More than half had less than 10 years of such experience, and about 20 percent, 10 to 19 years. Less than 10 percent had had 20 or more years' experience before they entered public health. There was no essential difference between the workers in State and local agencies or between high-echelon and staff-level personnel in this respect, but

**Table 2. Duration of experience outside public health of personnel in State and local health departments<sup>1</sup>**

Administrative level and service	Number supplying information	Percent with stated number of years' experience				
		None	1-4	5-9	10-19	20 or more
<i>High-echelon</i>						
Medical.....	68	7	31	29	21	12
Nursing.....	84	14	36	26	22	2
Sanitation.....	36	20	33	31	8	8
Laboratory.....	27	44	15	19	15	7
Administration.....	15	7	20	20	40	13
Health education.....	7	14	0	29	43	14
Statistics.....	10	10	10	50	20	10
Other.....	31	10	13	32	29	16
<b>Total.....</b>	<b>278</b>	<b>15</b>	<b>27</b>	<b>28</b>	<b>21</b>	<b>9</b>
<i>Staff</i>						
Medical.....	12	0	50	17	25	8
Nursing.....	96	9	38	32	18	3
Sanitation.....	66	15	21	27	26	11
Laboratory.....	84	33	30	19	11	7
Health education.....	14	21	29	36	14	0
Statistics.....	21	29	38	19	14	0
Other.....	24	4	38	29	25	4
<b>Total<sup>2</sup>.....</b>	<b>317</b>	<b>18</b>	<b>32</b>	<b>26</b>	<b>18</b>	<b>6</b>

<sup>1</sup> Includes visiting nurse associations.

<sup>2</sup> Total percentages are only approximations, because the staff-level sample was not equally representative of all services.

again the laboratory service differed from the other services. Forty-four percent of the high-echelon and 33 percent of the staff laboratory workers, as compared with 12 percent of the personnel in the other services, had worked only in public health.

Approximately 25 percent of the personnel had worked in other fields than public health for 10 years or longer. This percentage does not appear to be inordinately high in the light



**Table 3. Areas of experience outside public health of personnel in State and local health departments <sup>1</sup>**

Administrative level and service	Number supplying informa- tion	Percent with experience in—							
		Business, industry	Government agency <sup>2</sup>	Schools	Colleges	Welfare, social agencies	Private practice	Hospi- tals, insti- tutions	Other
<i>High-echelon</i>									
Medical.....	63	16	10	2	25	8	54	49	9
Nursing.....	73	12	7	20	14	7	34	67	12
Sanitation.....	36	56	25	8	19	0	8	0	3
Laboratory.....	16	44	19	12	44	0	12	12	0
Administration.....	15	60	47	7	0	7	0	13	13
Health education.....	7	57	14	29	43	43	14	0	0
Statistics.....	9	56	56	0	22	11	0	11	0
Other.....	30	20	30	37	10	37	20	53	7
Total.....	249	28	18	14	19	10	28	41	9
<i>Staff</i>									
Medical.....	12	33	8	17	17	0	50	50	0
Nursing.....	87	24	5	7	5	7	40	72	6
Sanitation.....	60	77	23	5	12	0	12	2	0
Laboratory.....	58	45	19	17	12	2	9	38	2
Health education.....	11	54	9	27	0	0	9	9	9
Statistics.....	15	80	27	47	20	0	0	0	13
Other.....	33	33	15	18	3	21	27	21	3
Total <sup>3</sup> .....	276	46	14	13	9	5	23	36	4

<sup>1</sup> Includes visiting nurse associations.

<sup>2</sup> Not including schools, hospitals and related institutions, and health and welfare departments.

<sup>3</sup> Total percentages are only approximations, because the staff-level sample was not equally representative of all services.

of the general job mobility that prevails in the United States.

The contention that most physicians in public health enter the field after a long period of private practice is not borne out by this study. Only half of the physicians interviewed had been in private practice at any time during their careers. Only one-third had spent as long as 10 years in fields other than public health, and only 10 percent, as long as 20 years.

Hospitals and related institutions and business and industry were the most common areas in which public health personnel had worked (table 3). About 40 percent had been employed in each of these areas. One-half of the physicians and three-fourths of the nurses had been employed in hospitals. More than half of the workers in most of the other services had been employed in business or industry. One in every six workers had been employed by a Govern-

ment agency other than a health or welfare department, hospital, or school. One in seven had worked in a school, and a similar proportion in a college. Roughly, 5 percent had been employed by a welfare or social agency.

State and local personnel showed no major differences in past experience, but significant differences were found between high-echelon and staff workers. A larger proportion of staff than of high-echelon personnel had worked in business or industry, but the reverse was true in relation to previous employment in colleges.

### Reason for Entering Public Health

The three most frequent determinants for entering public health were chance, personal contacts, and the attraction of the work (table 4). Each of these was given by slightly more than 20 percent of the workers. Less than this per-

centage gave favorable working conditions as their reason for entering public health. About 10 percent stated that they entered public health because of specific education and training for this career. Three other factors, namely, a "calling" to do public health work, political appointment, and the use of a public health job as a means of education or training for another career, played negligible roles.

Chance as a reason for entering public health requires no amplification. Those who gave attraction of the work as their reason for entering public health were expressing one of the two concepts: either that the content of public health work was inherently varied, challenging, and satisfying, or that the work provided opportunities for helping people. Of those who gave personal contacts as their reason for being in public health, the majority stated that these contacts were with public health workers. A small number stated that they entered public

health because of casual informal counseling, but only 2 of 595 workers could attribute their entry into public health to formal vocational guidance.

The most attractive aspect of working conditions in public health appeared to be the hours of work. One-quarter of those who gave working conditions as their reason for entering public health mentioned this factor specifically. Salary and job security were each mentioned by one-sixth of these workers.

Reasons for entering public health did not vary with either governmental or administrative level. The one outstanding difference among the services was that a greater proportion of laboratory workers than of personnel in the other services entered public health fortuitously. Whereas less than one-quarter of all public health workers came into the field by chance, chance accounted for the entry of two-fifths of the laboratory workers.

**Table 4. Reasons given for entering public health by personnel in State and local health departments<sup>1</sup>**

Administrative level and service	Number supplying information	Percent giving stated reason							
		Chance	Personal contacts	Work content	Working conditions	Educational and training	"Calling"	"Stepping stone"	Political appointment
<i>High-echelon</i>									
Medical.....	66	12	24	29	21	9	3	0	2
Nursing.....	81	9	25	28	12	21	4	1	0
Sanitation.....	39	18	44	5	13	13	0	5	2
Laboratory.....	28	39	36	0	7	11	0	4	4
Administration.....	14	43	0	14	36	0	0	0	7
Health education.....	8	38	12	25	0	12	0	0	12
Statistics.....	10	40	20	10	20	10	0	0	0
Other.....	34	24	35	24	6	12	0	0	0
Total.....	280	19	28	20	14	13	2	1	2
<i>Staff</i>									
Medical.....	12	8	8	17	42	25	0	0	0
Nursing.....	88	14	18	28	20	16	3	0	0
Sanitation.....	68	20	15	18	25	7	3	3	9
Laboratory.....	84	41	17	15	15	5	0	7	0
Health education.....	14	21	37	7	21	14	0	0	0
Statistics.....	18	55	22	11	0	6	6	0	0
Other.....	31	26	16	26	23	0	6	3	0
Total <sup>2</sup> .....	315	26	18	20	20	9	2	3	2

<sup>1</sup> Includes visiting nurse associations.

<sup>2</sup> Total percentages are only approximations, because the staff-level sample was not equally representative of all services.

## Public Health Experience

Sixty-three percent of the personnel in administrative positions and 33 percent of the staff had had 10 or more years' experience in public health (table 5). Thirty percent of the former and 15 percent of the latter had been engaged in public health for 20 years or longer. High-echelon personnel had spent an average of 14.6 years in public health; staff personnel, an average of 9.2 years. Except for the fact that more State (84 percent) than local (44 percent) sanitation personnel in the higher administrative echelons had been employed in public health for 10 years or more, there were no significant differences between State and local personnel. Neither were there significant differences among the services.

The number of years that the personnel had spent in their present agencies is to be found in table 6. Approximately one-third of all high-

**Table 5. Duration of public health experience of personnel in State and local health departments <sup>1</sup>**

Administrative level and service	Number supply- ing infor- mation	Percent with stated number of years' experience			
		1-4	5-9	10-19	20 or more
<i>High-echelon</i>					
Medical-----	67	18	24	24	34
Nursing-----	82	7	17	48	28
Sanitation-----	41	5	27	39	29
Laboratory-----	28	18	0	32	50
Administration-----	14	29	14	43	14
Health education-----	8	25	50	0	25
Statistics-----	10	30	20	30	20
Other-----	34	32	32	18	18
Total-----	284	16	21	33	30
<i>Staff</i>					
Medical-----	12	42	17	33	8
Nursing-----	89	43	26	13	18
Sanitation-----	69	48	17	15	20
Laboratory-----	77	44	33	18	5
Health education-----	13	23	46	15	15
Statistics-----	21	43	9	24	24
Other-----	33	36	18	33	12
Total <sup>2</sup> -----	314	43	24	18	15

<sup>1</sup> Includes visiting nurse associations.

<sup>2</sup> Total percentages are only approximations, because the staff-level sample was not equally representative of all services.

**Table 6. Years in present agency of personnel in State and local health departments <sup>1</sup>**

Administrative level and service	Number supply- ing infor- mation	Percent with stated number of years in present agency			
		1-4	5-9	10-19	20 or more
<i>High-echelon</i>					
Medical.....	68	40	25	24	12
Nursing.....	84	34	32	24	10
Sanitation.....	39	23	18	31	28
Laboratory.....	28	36	11	25	28
Administration.....	15	33	27	27	13
Health education.....	8	50	38	12	0
Statistics.....	11	36	18	27	18
Other.....	31	62	16	16	6
Total.....	284	38	24	24	14
<i>Staff</i>					
Medical.....	12	58	17	17	8
Nursing.....	95	54	25	12	10
Sanitation.....	65	54	17	12	17
Laboratory.....	85	53	27	15	5
Health education.....	14	43	36	7	14
Statistics.....	21	24	28	24	24
Other.....	24	50	17	25	8
Total <sup>2</sup> .....	316	51	24	14	11

<sup>1</sup> Includes visiting nurse associations.

<sup>2</sup> Total percentages are only approximations, because the staff-level sample was not equally representative of all services.

echelon personnel had worked in their present agencies for less than 5 years; one-quarter, 5 to 9 years; another quarter, 10 to 19 years; and one-sixth, 20 years or longer. Roughly half of the staff personnel had been with their present agencies for less than 5 years; one-quarter, 5 to 9 years; one-sixth, 10 to 19 years; and one-tenth, 20 years or longer. There was only one significant difference between State and local personnel. Almost half of the high-echelon sanitation personnel in State health departments had worked for the same agency for 20 years or longer, but none of the high-echelon sanitation personnel in local health departments had had such experience.

Three-quarters of the high-echelon personnel in public health for 10 to 19 years had worked for the same agency for a like period of time; half of those with longer public health experience had spent at least 20 years in their present agency. The experience of staff personnel was

**Table 7. Past experiences that State and local health department<sup>1</sup> personnel have found particularly valuable**

Administrative level and service	Num- ber supply- ing in- forma- tion	Percent in specified category						
		General learning	Know- ledge of commu- nity	Admin- istra- tion	Phil- osophy	Specific tech- nical proce- dures	Inter- personal relations	Other
<i>High-echelon</i>								
Medical.....	67	28	40	15	27	18	19	13
Nursing.....	83	41	31	36	14	13	23	24
Sanitation.....	39	51	28	20	13	36	15	10
Laboratory.....	28	29	4	36	7	29	14	18
Administration.....	15	27	13	67	7	0	0	20
Health education.....	8	12	25	12	0	62	12	25
Statistics.....	10	70	0	30	0	30	20	0
Other.....	31	6	45	19	13	13	23	32
Total.....	281	34	30	28	15	20	18	19
<i>Staff</i>								
Medical.....	12	25	42	8	8	8	25	17
Nursing.....	95	26	17	5	5	16	34	28
Sanitation.....	66	24	9	20	4	44	35	4
Laboratory.....	83	20	5	11	0	40	4	31
Health education.....	14	7	36	29	0	57	7	14
Statistics.....	20	5	5	10	0	30	15	25
Other.....	24	21	21	12	0	38	17	8
Total <sup>2</sup> .....	314	22	13	12	3	32	22	21

<sup>1</sup> Includes visiting nurse associations.

<sup>2</sup> Total percentages are approximations only, because the staff-level sample was not equally representative of all services.

similar. Three-quarters of those with either 10 to 19, or 20 or more years' experience had worked for their present agency for comparable periods.

### Most Valuable Experiences

The workers were questioned about the attributes of their total work experience which they considered most valuable, and 1 to 3 answers were obtained from each respondent. These were classified in seven categories, as follows: (a) knowledge and appreciation of the community, which covers comments concerning communities and their components in general, as well as specific communities, and techniques for working with community groups and individuals; (b) knowledge and appreciation of organization and administration, which covers all phases of management and supervision; (c) development of a philosophy of public health or government; (d) learning about

interpersonal relations and development of qualities of personality that would promote good relations; (e) learning specific technical procedures, including the techniques of communication; (f) learning about public health generally and about working in a public health organization; and (g) a residual category, which includes statements too general to be classified under any of the other categories.

Either because their past experiences had been different or because they viewed their past experiences differently, high-echelon and staff personnel differed as to what they considered most valuable (table 7). Approximately one-third of the former and one-fifth of the latter were impressed with the general learning opportunities that their experience had provided. The opportunities for learning about the community and for learning about administration were considered important by one-third of the personnel at the higher administrative levels but by only one-eighth of those at staff level.

Whereas 15 percent of high-echelon personnel felt that their past experience was particularly valuable because of the opportunities it afforded them to develop a philosophy of public health, only 3 percent of staff personnel gave this reason. One-third of the staff personnel, as compared to one-fifth of the personnel in higher positions, emphasized the opportunities for learning specific technical procedures as being particularly valuable. Only in regard to experience in interpersonal relations were the staff and higher administrative groups similar. One-fifth of each group felt that their past experience was unusually valuable because of

the experience it gave them in interpersonal relations.

There were also a number of striking differences among the services. Among high-echelon personnel, members of the laboratory service mentioned knowledge of the community infrequently. A relatively large proportion of medical personnel emphasized philosophy. A larger percentage of sanitation and laboratory personnel than of medical and nursing personnel stated that the opportunities in their past experience for learning specific technical procedures were especially valuable.

Among staff personnel, members of the medi-

**Table 8. Relation between public health experience and salary of high-echelon personnel in State and local health departments <sup>1</sup>**

Service and duration of experience in years	Number supplying information	Percent with stated salary					Mean salary
		\$3,000-3,999	\$4,000-5,999	\$6,000-7,999	\$8,000-9,999	\$10,000 or more	
Medical.....	64	0	5	17	42	36	\$9,300
1-9.....	26	0	0	27	35	38	9,300
10-19.....	16	0	1	19	44	25	8,800
20 or more.....	22	0	4	4	50	41	9,500
Nursing.....	81	28	62	10	0	0	4,500
1-9.....	19	47	53	0	0	0	4,000
10-19.....	39	20	72	8	0	0	4,500
20 or more.....	23	26	52	22	0	0	4,900
Sanitation.....	42	10	40	26	19	5	6,300
1-9.....	13	15	62	23	0	0	5,000
10-19.....	16	6	38	31	19	6	6,700
20 or more.....	13	8	23	23	38	8	7,200
Laboratory.....	28	4	50	18	14	14	6,700
1-9.....	5	0	40	40	20	0	6,300
10-19.....	9	11	44	11	11	22	6,700
20 or more.....	14	0	57	14	14	14	6,800
Health education.....	20	20	55	20	5	0	5,200
1-9.....	11	27	64	9	0	0	4,500
10-19.....	6	17	50	17	17	0	6,000
20 or more.....	3	0	33	67	0	0	5,800
Statistics.....	10	30	30	20	20	0	5,500
1-9.....	5	60	20	20	0	0	4,300
10-19.....	3	0	67	0	33	0	6,200
20 or more.....	2	0	0	50	50	0	7,500
Administration.....	14	29	43	14	14	0	5,500
1-9.....	6	17	50	0	33	0	6,000
10-19.....	6	50	33	17	0	0	4,700
20 or more.....	2	0	50	50	0	0	6,500
Other.....	33	15	67	6	9	3	5,400
1-9.....	21	19	71	5	5	0	5,000
10-19.....	6	0	50	17	17	17	6,800
20 or more.....	6	17	67	0	17	0	5,200

<sup>1</sup> Includes visiting nurse associations.

cal and health education services emphasized the opportunities for learning about the community, but such opportunities seemed to be of relatively little importance for sanitation, laboratory, and statistics personnel. Relatively few physicians and nurses mentioned learning specific technical procedures as important.

### Salary and Experience

Because of salary differentials associated with service, the relation of salary to public health experience was investigated for the several services separately, as shown in tables 8 and 9. The average salary of staff nurses was less than that of any other service group of staff workers. The staff physician earned more than twice as

much as staff workers in the other services. A relatively smaller differential existed between the salaries of staff and high-echelon personnel in the medical service than in the other services.

Except that a significantly larger proportion of State than of local nurses at the higher administrative levels earned \$4,000 a year or more, and that a significantly larger proportion of State than of local sanitation personnel at the higher administrative levels earned \$5,000 a year or more, there were no significant State-local differences. Inasmuch as 19 percent of the State nurses and 25 percent of the local nurses had had less than 10 years' experience in public health, the salary differential for nurses could not be attributed to quantitative differences in experience. The situation was different

**Table 9. Relation between public health experience and salary of staff personnel in State and local health departments <sup>1</sup>**

Service and duration of experience in years	Number supplying information	Percent with stated salary							Mean salary
		\$2,000-2,999	\$3,000-3,999	\$4,000-4,999	\$5,000-5,999	\$6,000-7,999	\$8,000-9,999	\$10,000-or more	
Medical.....	11	0	0	0	9	45	36	9	\$7,900
1-9.....	6	0	0	0	0	50	33	17	8,200
10-19.....	4	0	0	0	0	50	50	0	8,000
20 or more.....	1	0	0	0	100	0	0	0	5,500
Nursing.....	89	25	65	10	0	0	0	0	3,400
1-9.....	61	24	66	10	0	0	0	0	3,400
10-19.....	12	25	75	0	0	0	0	0	3,200
20 or more.....	16	25	56	19	0	0	0	0	3,400
Sanitation.....	69	6	52	17	19	6	0	0	4,200
1-9.....	45	7	47	20	20	7	0	0	4,200
10-19.....	10	0	60	0	30	10	0	0	4,400
20 or more.....	14	7	64	21	7	0	0	0	3,800
Laboratory.....	76	14	36	43	4	3	0	0	3,900
1-9.....	58	19	40	34	3	3	0	0	3,800
10-19.....	14	0	21	72	7	0	0	0	4,400
20 or more.....	4	0	25	75	0	0	0	0	4,200
Health education.....	13	0	31	61	8	0	0	0	4,300
1-9.....	9	0	22	67	11	0	0	0	4,400
10-19.....	2	0	0	100	0	0	0	0	4,500
20 or more.....	2	0	100	0	0	0	0	0	3,500
Statistics.....	21	19	52	24	0	5	0	0	3,700
1-9.....	11	18	36	45	0	0	0	0	3,800
10-19.....	5	20	60	0	0	20	0	0	3,900
20 or more.....	5	20	80	0	0	0	0	0	3,300
Other.....	33	15	42	24	9	9	0	0	4,100
1-9.....	18	22	33	22	17	6	0	0	4,100
10-19.....	11	9	54	18	0	18	0	0	4,200
20 or more.....	4	0	50	50	0	0	0	0	4,000

<sup>1</sup> Includes visiting nurse associations.

for sanitation personnel, however. Only 15 percent of the sanitation workers in State agencies, as compared to 56 percent of those in local agencies, had had less than 10 years' experience in public health.

As can be seen in table 8, there is a tendency in all the services, except medical and administration, for higher salaries for high-echelon personnel to be associated with longer experience in public health.

Table 9 shows the distribution of staff-level workers in accordance with salary and duration of public health experience. An unexpected finding here is that salary does not increase with increased experience in public health. Actually, in more than half of the services, the staff worker with 20 years' or more experience in public health earns less than the less-experienced individual. This may indicate, of course, that workers who have remained in staff positions for this long period of time have less ability than their co-workers, since, despite their experience, they have been unable to advance in the administrative hierarchy, but there may be other explanations. Only through promotion to a higher rank can the staff worker in a public health agency hope to better his earnings materially.

### Summary and Discussion

As a part of the Yale Public Health Personnel Research Project, data on work experience were obtained from more than 600 professional

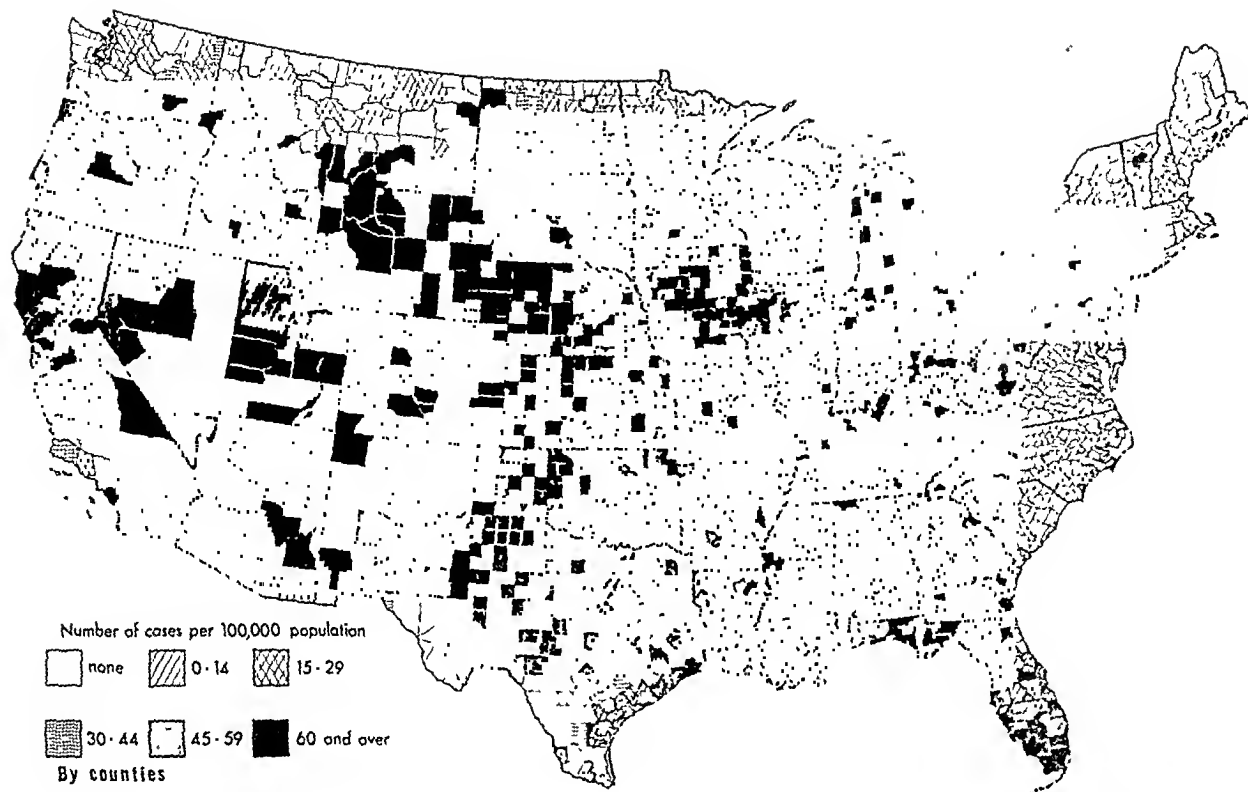
and semiprofessional personnel in State and local health departments and visiting nurse associations in 4 States. Although the data are not of a nature to permit firm conclusions concerning utilization and recruitment of personnel, they do bring to mind several questions that warrant consideration.

Perhaps the most important of the findings were those concerning when and how persons enter the field of public health. Few workers, it was found, entered the field at the beginning of their careers. Chance was one of the three most frequently given reasons for entering public health, whereas formal vocational counseling was mentioned by only 2 of 595 workers.

Can experience in fields other than public health contribute in a significant fashion to the success of the worker in his public health job? If so, public health administrators must make a conscious effort to make maximal use of the past experience of their workers. To what extent is this being done?

If, on the other hand, experience in fields other than public health is not essential nor even beneficial to public health workers, what can be done to alter the situation? The fact that chance played a major role in directing workers into public health certainly indicates a lack of systematic planning for recruitment of public health workers. It would not be unreasonable to assume that recruitment for public health could benefit by serious study and conscious planning.





## Poliomyelitis in the United States, 1954

The year 1954 marks the end of an era in poliomyelitis incidence in the United States. The era began in 1894 when Caverly investigated and reported upon an epidemic in Vermont. Although there are records of the existence of poliomyelitis in this country prior to 1894, this epidemic apparently was the first extensive one to be recognized. During the following 25 years the etiological agent of the disease was found and epidemiological characteristics accurately described. During this period severe epidemics occurred in various parts of the country, particularly in the decade from 1907 to 1916. Incidence remained relatively low from about 1920 to 1944, when more widespread epidemics began to occur.

*Dr. C. C. Dauer, medical adviser of the National Office of Vital Statistics, Public Health Service, prepared this report. His previous annual report on poliomyelitis appeared in the December 1954 issue of Public Health Reports, pp. 1185-1186.*

Although various measures, including vaccination, for control of poliomyelitis had been proposed or developed prior to 1954, none was effective. The success of the field trials in 1954 of the most recently developed vaccine may not have an immediate effect in reducing total incidence significantly, but it is a sign of a new era in preventing paralytic effects.

Incidence of poliomyelitis in the United States in 1954 was slightly below the average for the previous 5 years. The death rate remained relatively low, about 1.0 per 100,000 population.

	Number cases reported	Case rate per 100,000	Death rate per 100,000
1949.....	42,033	28.3	1.8
1950.....	33,300	22.1	1.3
1951.....	28,386	18.5	1.0
1952.....	57,879	37.2	2.0
1953.....	35,592	22.5	1.1
Average 1949-53....	39,438	25.7	1.4
1954.....	38,476	23.9	<sup>1</sup> 1.0

<sup>1</sup> Estimated.

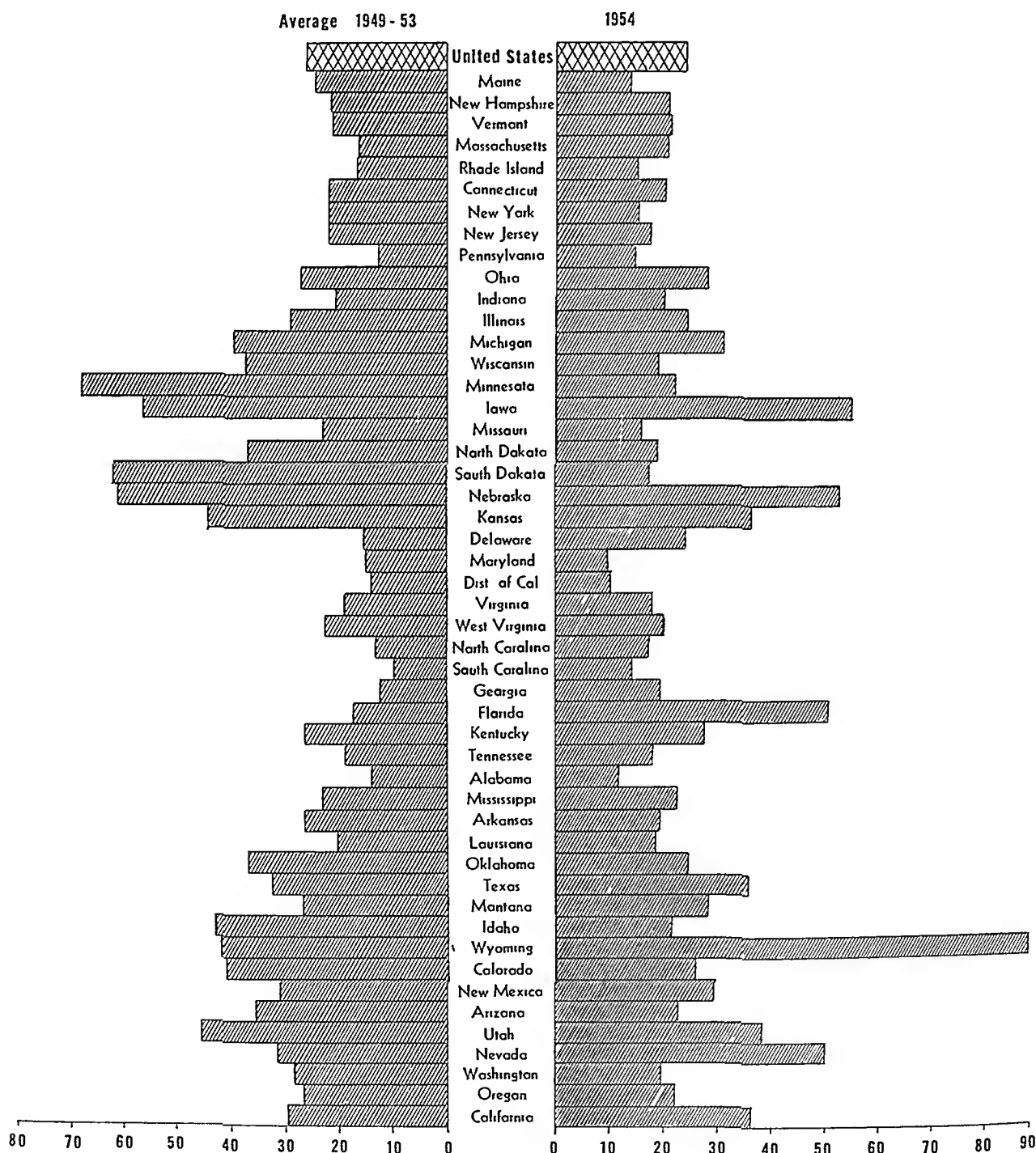


The map shows the distribution of poliomyelitis by counties in 1954. Large areas of relatively high incidence, that is, rates in excess of 60 per 100,000 population, were located in Florida, Texas, Iowa, Kansas, Nebraska, Wyoming, Utah, and Nevada. Many smaller areas also experienced high attack rates. Incidence was high in both Iowa and Nebraska in 1952,

when western Iowa and eastern Nebraska were part of a larger epidemic area, but these sections had relatively low rates in 1954.

The chart shows the mean incidence or attack rates per 100,000 population for the 5-year period 1949-53 and for 1954. During the 5 years the attack rates were relatively high in the North Central, Mountain, and Pacific States

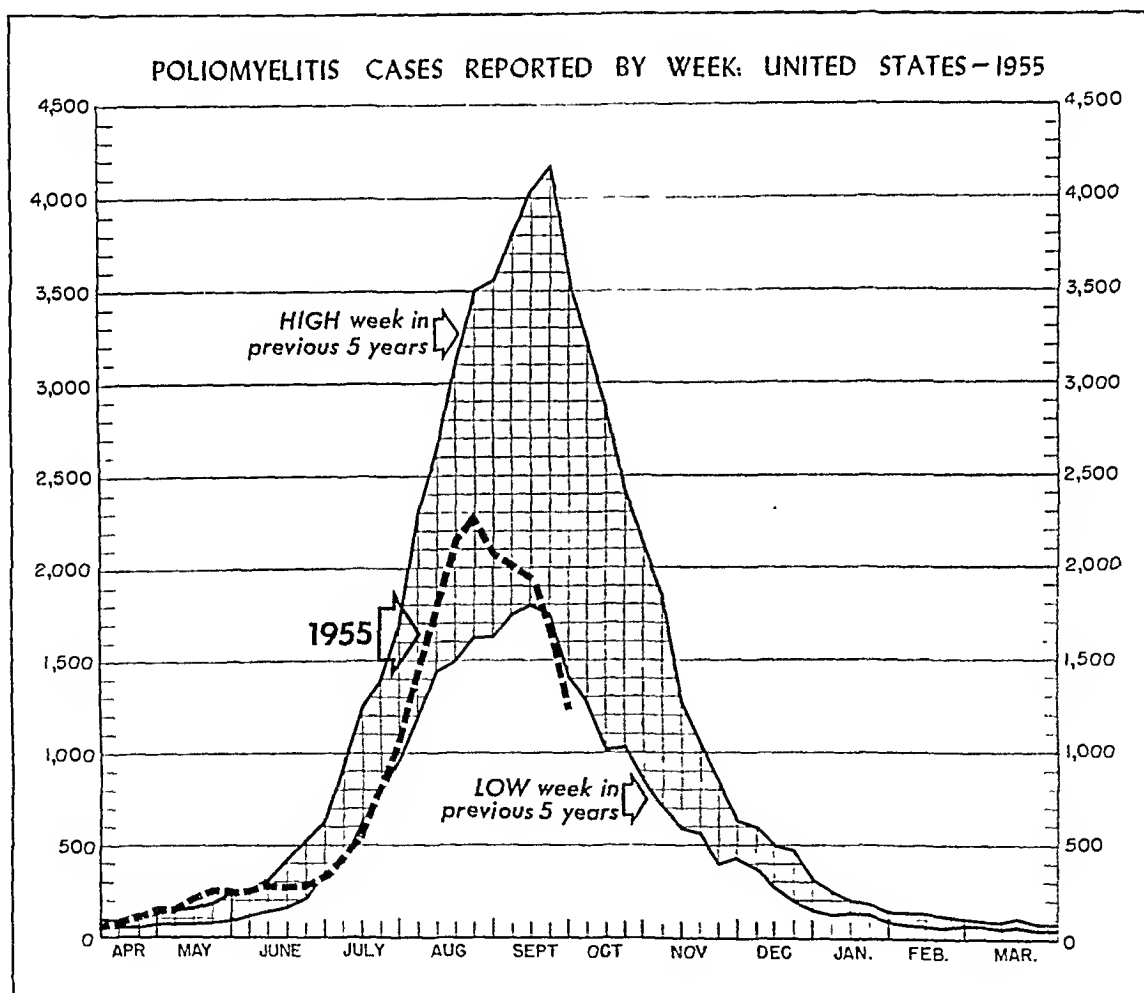
Poliomyelitis morbidity rates per 100,000 population in the United States and by State.



In 1954, 5 States had attack rates in excess of 50, and all but 1, Florida, were in the areas where incidence had been relatively high during the previous 5 years. Four other States had attack rates of 30 or more per 100,000 population. The exceptionally high incidence in Florida was due to the occurrence of a large number of cases late in the season, that is, in October. These cases were reported principally in a few counties in the northern part of Florida. A large proportion of cases occurred in adults. Paralysis of varying degrees was reported in 80 percent of the cases in this area. In other States with a high incidence, the occurrence of the disease followed the usual seasonal pattern characteristic of the respective areas.

Of the 38,476 cases reported in 1954, 48 percent were classed as paralytic, 34 percent as nonparalytic, and in 18 percent the type of disease was not specified. The corresponding figures for 1953 were 44, 34, and 22 percent, respectively. There has been a gradual change over the past 5 years with respect to the number reported in the unspecified group. This change indicates that greater efforts are being made to classify cases as either paralytic or nonparalytic. In 1954, 11 States classified all cases as paralytic and nonparalytic, and 5 reported less than 1 percent in the unspecified group. In 1954 only 1 State reported all cases as unspecified in contrast with 17 who made no differentiation of any cases in 1951.

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# technical publications

## Health Manpower Source Book

### Dentists

*Public Health Service Publication No. 263, section 7, 1955. By Elliott H. Pennell and Maryland Y. Pennell. 159 pages; tables. \$1.25.*

This seventh section of the Health Manpower Source Book series presents data on the number, characteristics, and distribution of dentists in the United States. Mid-1952 distributions of non-Federal dentists are indicated for several county groupings and for the graduates of individual dental schools by year of graduation and current location of the dentists. The basic material represents enumerations from information supplied for individual dentists in the 1953 American Dental Directory published by the American Dental Association. In addition, United States census data are presented for dentists in the labor force to show trends from 1900 to 1950 and, for 1950, the characteristics of dentist in terms of age, race, sex, employment status, and income level.

## Occupational and Related Dermatoses

Abstracts from the literature, July 1943 to December 1953, inclusive.

*Public Health Service Publication No. 364. Public Health Bibliography Series No. B2. 1954. By Donald J. Birmingham and Paul C. Campbell. 183 pages. 65 cents.*

A continuation of Public Health Bulletins Nos. 266 (1941) and 284 (1944), this publication carries forward abstracts of the literature on occupational and related skin diseases from July 1943 through December 1953. It is intended as a reference for dermatologists, industrial

physicians, and others interested in contact dermatoses.

Since practically every branch of industry, including agriculture, has exposures that may produce skin diseases, the volume of the pertinent literature necessitated limiting the articles chosen to representative papers in many subject areas. Wherever feasible the articles have been arranged according to the offending agent.

## Staffing the General Hospital, 25-100 Beds

*Public Health Service Publication No. 417. 1955. By Margaret K. Shafer. 32 pages; illustrated. 25 cents.*

These staffing guides, developed from 1-day data collected in 22 selected hospitals of less than 100 beds, help hospital and health authorities plan health facilities under the Hospital and Medical Facilities Survey and Construction Program.

Charts show number of persons by department for various sized hospitals; hours of nursing care per patient per day; and percent of nursing personnel assigned by shift of service and by size of hospital. Tables further clarify staffing problems.

## Sanitary Aspects of the Shellfish Industry of Japan

*Public Health Service Publication. Unnumbered. 1954. By L. R. Shelton, Jr., and Richard S. Green. 51 pages; illustrated.*

To provide background information for application of the legal responsibilities of the Food and Drug Administration on imports of frozen shellfish, and to advise the Japanese Government on sanitary practices, contributing to the protection of consumers, were the two

purposes of this survey, made at the request of the Japanese Government.

The information is particularly helpful to American importers and health officials. Of interest primarily to the Japanese are the recommendations on sanitary practices, most of which are already well-established in the United States.

## Spanish Edition of Standard Methods

A Spanish language edition of Standard Methods for the Examination of Water, Sewage, and Industrial Wastes, 1955, will soon be available. The translation was made by Chemical Engineer P. J. Caballero, chief of the water and sewage laboratory in the Ministry of Hydraulic Resources of Mexico.

Its publication on a nonprofit basis has been authorized by the American Public Health Association, the American Water Works Association, and the Federation of Sewage and Industrial Wastes Associations. The Health, Welfare, and Housing Field Party of the Institute of Inter-American Affairs in Mexico is sponsoring the publication of this book at \$6. Order accompanied by a draft or check for the exact amount of the order on a United States bank should be addressed to: Dr. Trois E. Johnson, chief, Health, Welfare, and Housing Field Party, Institute of Inter-American Affairs, American Embassy, Mexico, D. F., Mexico.

This section carries announcements of all new Public Health Service publications and of selected new publications on health topics prepared by other Federal Government agencies.

Publications for which prices are quoted are for sale by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. Orders should be accompanied by cash, check, or money order and should fully identify the publication. Public Health Service publications which do not carry price quotations, as well as single sample copies of those for which prices are shown, can be obtained without charge from the Public Inquiries Branch, Public Health Service, Washington 25, D. C.

The Public Health Service does not supply publications issued by other agencies.

# Human Behavior Factors in Program Planning

By ANDIE L. KNUTSON, Ph.D.

TODAY, more than ever before, we need to understand how people act in matters that concern their health and why they behave as they do.

Many of the current problems of public health, such as the chronic diseases—heart diseases, cancer, diabetes, arthritis, blindness—cannot be identified, defined, and solved without the active participation and help of the public. This is true also of the problems of aging, industrial health, mental health, maternal and child care, nutrition, medical rehabilitation, accident control, and the hygiene of housing (1, 2).

If we wish to enlist the active participation of people in public health programs, we need to develop these programs to take care of their problems as they see them or to satisfy the needs they identify. In making decisions we also need to consider what resources people will use, what actions people are willing to take to solve their problems, and the type of health service organization they are ready to accept.

Several factors concerning human behavior

seem to deserve further consideration in planning public health programs to meet today's public health goals. While these factors are discussed separately here, they are so closely interrelated and interdependent that in life situations they cannot be isolated, one from another.

## Uniqueness of the Individual

Each person is a unique individual. Each is born into society with his own peculiar pattern of biologically determined capabilities, abilities, and characteristics that make him from birth different from every other human being. As this individual develops and grows in his own unique way and in his own special world, he learns through experience particular ways of thinking and acting. These serve in applying the resources he has in taking advantage of opportunities to satisfy his needs and wants.

As he grows, the individual acquires a sense of belongingness or personal identification with specific groups within his surroundings—at first, perhaps, with his family and play groups; later they may include his school and work groups, clubs, union, church, PTA, political party, or professional organization. He becomes identified also as a member of a particular ethnic, occupational, and social group.

As he acquires a strong identification with such groups, their norms and values help to form his norms and values; their interests and wants influence his interests and wants. To a

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*Dr. Knutson is chief of Behavioral Studies, Division of General Health Services, Public Health Service. His paper, presented at the annual meeting of the Nebraska Public Health Association, Omaha, September 1954, is published here in somewhat abbreviated form.*

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large extent he adopts their purposes and goals as his own. Yet throughout he remains a unique individual, wanting, hoping, striving for and expecting—yes, and fearing—different things than anyone else. How he acts to apply his own pattern of abilities and talents to achieve his ends is also different in some ways from any other member of his special pattern of groups (3-5).

This uniqueness of the individual is of primary importance in public health planning. A person's health is one of the most intimate aspects of his personality. The nature of his concerns is a highly personal matter—so personal, in fact, that he may have difficulty in communicating with anyone about it.

The case finding, diagnosis, and treatment of chronic diseases may be seriously hampered because an individual with symptoms may have had unique experiences that make him afraid to acknowledge the symptoms; or his experiences may have led him to distrust the methods of diagnosis and treatment offered. He may have learned to place greater faith in less scientific ways of dealing with his health problems.

If the groups to which he belongs attach shame or weakness to certain health conditions, he may not be able to acknowledge—perhaps even to himself—that he has such a condition. For social barriers are often more effective motivators than physical force.

### Differences Among Communities

A second major factor to consider in planning is that the members of each community also differ as a group in many ways from those of any other community. They differ in the nature and seriousness of their problems, in the extent and quality of their resources, and in the various possibilities they have for action in solving their problems.

They are likely to differ, also, in the pattern and quality of their leadership. While in some communities there may be many effective leaders, in others the leadership may reside with a few appointed or elected officials who may exert their control through a wide variety of groups. In some communities, nearly all the major decisions are made by one individual or by persons directly responsible to him.

The methods of communication available to members of different communities also vary so that no single means of communication can be assumed to be effective everywhere. The channels of communication available in a metropolitan center may include newspapers, theaters, radio, television, churches, political organizations, and a wide variety of similar formal media. In addition, many informal channels, such as discussions in informal gatherings or neighborly gossip at the corner drugstore or post office, may serve as channels of communication. On the other hand, people living in a rural community may lack many of the formal means of communication. They may depend more upon the informal methods—in fact, these informal means may in some instances be developed to the extent that they are even more effective than the formal channels of the metropolis. Do you recall the use once made of the old party line? Very little happened in the community without everyone knowing about it.

Communities also differ in the way the citizens prefer to organize to solve their problems. Citizens of an industrial community, for example, are likely to prefer patterns of organization different from those prevailing in an agricultural community. This is especially likely if the resources and qualified personnel differ in the two areas. If a rural area lacks the equipment and personnel needed to diagnose certain health conditions, it may be necessary to transport the patient to some central clinic or hospital. Or, in the absence of adequate medical facilities, individuals in the rural community may be forced to lean more heavily on the limited facilities that are available.

It is not always possible to interest the members of all communities in the same type of actions, even though similar problems may exist. People living in a community which has a very narrow margin of security cannot afford the same approach as those residing in a community that has more economic security. If the people of a community have undergone serious economic hardships in the past, its leaders are likely to be cautious in accepting long-range responsibilities that may threaten their future economic security. For example, the leaders of a community that now lacks a local health unit may honestly feel that they cannot

afford such a unit, even though it would seem to the outsider to be well within their means. Even though it may seem within their means today, they may fear that they will not be able to afford it tomorrow, or at some future date.

The members of different communities vary in the way they adopt new programs. In most areas of our country we moved gradually from crude railroads and steam engines to a modern railroad system and then to air transportation; from horse and buggy and dirt roads, to early models of automobiles; and finally to a modern highway system and streamlined cars. This pattern of developing a transportation system has not been the same for all communities. People in some areas have changed almost directly from ox carts to air transportation (6).

Members of certain communities now lacking adequate public health services may prefer to start with some other type of service than that the public health people consider basic. They may consider their present means of dealing with these basic public health problems adequate and consequently, may prefer to maintain the type of organization that is now set up for handling such problems, even though professional workers consider this organization inadequate. Some of the lay leaders may be more concerned about providing solutions to newer problems of public health than they are about providing the traditional basic health services. If this is true, they might move more quickly into the development of programs concerned with problems of the aging population, mental health, accident prevention, or the chronic diseases—in short, their primary concern may be with problems that many existing health departments are just beginning to identify as public health problems.

If this situation exists in some communities now lacking adequate public health services, public health leaders might find it easier to develop effective public health organizations in these communities by starting in the direction community leaders identify as being of concern. As these leaders become better acquainted with public health, they will be better prepared to consider ways of dealing more effectively with the problems public health leaders consider more basic.

## Public Concern

A third major factor to consider in planning public health programs is that the people of the community need to recognize a problem and need to feel concerned about it before they are likely to take steps to solve it. Therefore, unless the problems, interests, or wants of the public are adequately identified and the public health program developed in terms of these, the public is not likely to be a willing participant in supporting and carrying out the program.

The matter of determining the public health problems in a community is, of course, basic to determining the kind of organization needed and the types of methods required to solve the problem. But the very process of determining public health problems with which the members of the community are faced from their point of view is beset with difficulty.

We must see that our questions or approaches do not limit the responses to our own ideas about problems or possibilities. This applies no matter what technique is used to identify problems or wants—questionnaires, interviews, projective tests, group discussions, or statistical analyses.

We are not likely to get an adequate and valid answer from the layman. For example, if we ask him to tell us about his public health problems or his public health needs. A man cannot report what he does not know or perceive. Unless he knows much more about public health than you or I did when we first entered this field, he will not be able to give an informative or meaningful answer to such a question. If the layman has any knowledge of public health at all, it is likely to be limited to what he has personally experienced. To a farmer, public health may mean milk inspection; to a parent, public health may mean what the school nurse does.

The fact that we are earnestly seeking to identify public health problems does not necessarily mean that we will be able to see them when they are presented to us. In any situation where professional and lay persons seek to cooperate, the differences in their patterns of thinking and perception are serious barriers to effective communication. At times, our professional patterns of thinking will prevent us from seeing the very thing we are seeking.

Johnson reports an incident which clearly illustrates this (?). A child with a persistent cough had his throat X-rayed for diagnosis. The radiologist reported there was nothing in the X-ray to show why the child was coughing. The cough persisted and the child returned to have another X-ray taken. Now, the shadow of a button was seen in the throat region. The button was removed and the coughing stopped. When the first X-ray was reexamined, the shadow of the button was seen there also but it had not been identified by the radiologist, who had assumed that the child had been X-rayed with his clothes on and that the button was on his shirt. The radiologist had failed to see the significance of the button for the problem at hand—that is, the diagnosis of the cause of the cough—because the other explanation seemed more reasonable. His perception had been in accord with previous experiences and was completely logical.

Close cooperation between the layman and the professional person is essential in identifying public health problems and the desires of the people of the community for action. Since representatives of the two groups are likely to identify different things in the same situation, two different patterns of problems and needs are likely to be developed when both are involved, perhaps at first independently. As these two patterns of problems are defined, both groups must join together for discussion in order to identify those on which there is common agreement and also to explore reasons for disagreement on others.

The layman on the one hand must acquire a better understanding of those problems and needs, identified by the professional person, that are so much concerned with his welfare. Unless the layman understands the need for some of the surveillance operations, such as immunization or milk and water control, he is not likely to give the public health person the support required to carry out programs of this type.

On the other hand, the public health person must recognize and understand those problems and concerns of the layman which may not at first glance appear to be within the scope of the established public health responsibility. If the layman places a high value on a medical reference service, a child accident prevention

program, recreation facilities for teen-agers, or prenatal care and well baby clinics, he is going to insist that action on these requirements be taken by someone.

### Seeing the Solution

A fourth major factor to consider in program planning is that people are most likely to take a particular action when they see that action as one that will adequately solve their problems or satisfy their concerns.

People who see false teeth as the best solution for bad teeth are not likely to take adequate steps to preserve the teeth they have. Rather, they may look forward to getting rid of their teeth and substituting false teeth for them. Conversely, those who see fluoridation of the water supply as a good way to prevent dental caries in children and are concerned about it, perhaps, because they have children of their own, are most likely to support a community fluoridation program.

One would not expect the community leaders who do not see a need for local health units to seek assistance in developing such units. Even though they may recognize serious public health problems, they will not try to organize local health units unless they believe these units will be able to cope with these problems.

### Opportunity for Action

Fifth, an opportunity for action must exist, and this opportunity must be perceived as both existing and possible. People must perceive the action as one they are both physically and psychologically able to take. For example, if the action involves attending a clinic, they must perceive the clinic as one they can get to at a time that does not interfere with their work or other essential activities. They must also see the clinic as one they are entitled to go to and one at which they feel welcome.

A person whose teeth are decaying may perceive the cost of repair as prohibitive even though it is possible to obtain adequate care at a price he can afford within the community. If he believes the cost is prohibitive, he is not likely to act, no matter what the situation actually is. By the same token, community leaders



may object to certain local programs. Even though they may appreciate the need, they may not agree that the proposed program is a reasonable possibility considering the resources they have available to them. If this were their perception of the situation, they might strongly oppose such a program as being unrealistic and seek some more meaningful way of satisfying their needs.

They might ask: "What is the use of talking about such a program when we simply don't have the funds, and we have no means of attracting the necessary personnel at the salaries we can pay? Isn't there some other way we can handle this problem? Would it be a good idea to make improvements in the way we are now handling it rather than trying something new that we won't be able to carry out?"

Any new services or organization developed within a community must also fit in with other programs going on in the community. If a service conflicts with such programs, its chances for success are more limited.

Meltzer found that community leaders must feel that a new program will help them in achieving their own objectives if they are to support it (8). Community leaders are not likely to give enthusiastic support to any program perceived as interfering with some of the things they personally wish to do or which they identify as responsibilities of their own organizations.

Thus, any action to be taken must not only be seen as possible but must also be seen as an action that does not conflict in any way with personal or group values of the people concerned. It is futile to urge the orthodox Hindu to boil the holy water of the Ganges to kill germs when his religion tells him not to boil holy water and not to kill anything. Likewise, it is useless to urge the orthodox Jew to serve milk to his children at all meals when this conflicts with his strict code which prohibits serving meat and dairy products at the same meal.

A midwestern farmer who places great value on his endurance and thinks it is sound practice to work off his indigestion after a heavy meal is likely to ridicule the idea of staying in bed with similar symptoms that may be related to a heart condition. If he takes pride in how healthy his children look, he may consider their

going for regular physical examinations or X-rays a sign of weakness in the family. It does not tie in with his frequent boast, "I've never been to a doctor in my life!"

A low-income family which identifies the public health clinic as a charitable type of organization and objects to the idea of accepting charity is not likely to patronize that clinic. It will not help much to tell them that the clinic has been designed to serve them and that they are welcome. The way they perceive it is the important thing.

By the same token, a community program must be organized in accordance with the customs and values of the community. For the customs and beliefs prevailing in a community are most effective forces in determining the types of actions the people of that community will take and the types of actions they will reject.

As Dorolle (9) has observed, "When we set about improving a people's health, we must put aside our own concepts of good and evil, better and worse, and not encroach upon the people's beliefs and cultural concepts. Everyone has the right to develop his own philosophy and to refuse any change in it which does not come from within himself; furthermore, it is useless to attempt to impose changes in cultural concepts from the outside. If such changes are imposed, they cause disequilibrium and misunderstanding which seriously compromise the work which is being attempted."

### Patterns of Behavior

The final point I would urge you to consider in planning public health programs is concerned with the patterns of thought and behavior of people. The action to be carried out must be consistent with the usual patterns of thinking and acting of the people concerned.

Few of us are willing to take the time and possibly suffer the embarrassment of brushing our teeth immediately after the noon meal every day, even though we may believe the dentist who advises us that this is a desirable practice. Likewise a workman with a heart condition is not likely to take a rest period in the morning or afternoon as recommended by the doctor if he feels that doing so may cause him to lose



his job. Nor is such a workman likely to take time out for the free X-ray service offered him if he thinks there is a possibility that positive findings will lead to his discharge from work and complete disruption of his family life.

Foster has pointed out that the failure to treat sick children was one of the most bitter criticisms leveled at the public health centers in South America. "It illustrates a failure of the people served to understand the fundamental difference between preventive medicine . . . and routine treatment of the sick and ailing" (10).

The results of preventive medicine are often more difficult to perceive than the results of clinical medicine. From the standpoint of the family, the distinction we make as professionals may not be as real or understandable as we sometimes assume. It is likely that some people in our own country also fail to distinguish between prevention and cure and thereby have difficulty understanding the need for separate types of organizations and services. Further exploration of this possibility may be most fruitful.

In brief, then, the remarkable success the public health team has achieved in solving the problems of the communicable diseases and environmental sanitation has resulted in more adequate control of many of these problems. Today, more of the problems of public health can only be identified, defined, and solved with the active participation and help of the public. Fortunately, the public today is better educated, better informed, and better able to participate in the solution of such problems.

A colleague in the American Psychological Association has drawn an analogy about psychology which may have some meaning to public health. He has called attention to tremendous changes that have occurred in the theory

and concepts of psychology and the implications this has for research and program. This challenges us to review our tools and to recognize that many of them which were developed to test the hypotheses of a quarter of a century ago are not adequate to explore modern concepts.

Solving the new problems of public health may also require new tools. In some instances completely new approaches may be required to keep pace with the phenomenal rate of achievement of the period through which we are passing.

#### REFERENCES

- (1) Derryberry, M.: Today's health problems and health education. *Pub. Health Rep.* 69: 1224-1228, December 1954.
- (2) Kandle, R.: Changing aspects of public health. *Nursing Outlook* 49: 384-386, July 1953.
- (3) Cantril, H.: The place of personality in social psychology. *J. Psychol.* 24: 19-56, July 1947.
- (4) Cantril, H.: The "why" of man's experience. New York, N. Y., Macmillan Co., 1950.
- (5) Hastorf, A. H., and Knutson, A. L.: Motivation, perception, and attitude change. *Psychol. Rev.* 56: 88-94, March 1949.
- (6) McGranahan, D. V.: Some remarks on the human implications of technological change in underdeveloped areas. *Soc. Problems* 1: 13-16, June 1953.
- (7) Johnson, M. L.: Seeing's believing. In *New biology*, edited by M. L. Johnson, M. Abercrombie, and G. E. Fogg. London, Penguin Books, 1953, No. 15.
- (8) Meltzer, N. S.: A psychological approach to developing principles of community organization. *Am. J. Pub. Health* 43: 193-203, February 1953.
- (9) Dorolle, P.: Ethnologie et problèmes sanitaires. *Rev. Internat. Croix-Rouge* 35: 301-316, April 1953.
- (10) Foster, G., Editor: A cross-cultural anthropological analysis of a technical aid program. Washington, D. C., Smithsonian Institute, 1951, p. 65. Mimeographed.



# *Disposition of First Admissions to a State Mental Hospital*

This study of the experience of the Warren State Hospital, Warren, Pa., during the period 1916-50 has several purposes. The first is to acquaint epidemiologists, health officers, and other public health workers with some of the complex problems faced by mental hospital administrators in treating the increasing number of patients admitted to and resident in mental hospitals and in determining what happens to patients following admission. The second is to demonstrate a method for studying the flow of patients through the mental hospital and to apply this method to a study of changes in the rates at which first admissions to Warren State Hospital have been returned to the community or have died in the hospital. The third is to dispel the idea that the prognosis of patients committed to mental hospitals is hopeless. The fourth is to use the results of this historical study as a background for discussion of some basic epidemiological and clinical research needed to assist in the interpretation of the findings and in the formulation of public mental health programs directed toward care, treatment, and prevention of mental illness and disability.

A statistical analysis was made of the records of 15,472 first admissions to Warren State Hospital during the period 1916-50 to obtain an answer to the question, What has been the trend in the probabilities of separation from the hospital, either alive or dead, within specified periods following first admission for patients of specific age, sex, and diagnosis?

Patients were followed from the date of their first admission to the date of their first significant movement out of the hospital, defined as follows: the date of first release to the community on direct discharge or to convalescent care, whichever came first, or the date of death in the hospital. The date of placement on con-

valescent care was selected as an end point for this study because it represents a critical point in the life of the patient, when the staff agrees that once again he is ready to return to the community and to live outside the environs of the hospital.



## MONOGRAPH

### No. 32

The accompanying summary covers the principal findings presented in Public Health Monograph No. 32, published concurrently with this issue of Public Health Reports. The authors are with the National Institute of Mental Health, Public Health Service, Bethesda, Md., and the Warren State Hospital, Warren, Pa.

Readers wishing the data in full may purchase copies of the monograph from the Superintendent of Documents, United States Government Printing Office, Washington 25, D. C. A limited number of free copies are available to official agencies and others directly concerned on specific request to the Public Inquiries Branch of the Public Health Service. Copies will be found also in the libraries of professional schools and major universities and in selected public libraries.

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Kramer, Morton; Goldstein, Hyman; Israel, Robert H.; and Johnson, Nelson A.: A historical study of the disposition of first admissions to a State mental hospital. Public Health Monograph No. 32 (Public Health Service Publication No. 445). 25 pages. Illustrated. U. S. Government Printing Office, Washington, D. C., 1955.

Four periods were selected in which to describe the movement of patients: 1916-25, a period before the introduction of any major treatment program; 1926-35, when Warren State Hospital began to lay heavy stress on industrial and occupational therapy for all patients; 1936-45, a period in which some of the therapies in use were standardized and other new therapies were introduced; and 1946-50, when the medical staff was enlarged considerably, and when there was intensified use of electroshock and group and individual psychotherapy.

Some of the conclusions of this study and the questions they lead to are:

1. Of patients admitted to the hospital during 1946-50, a larger proportion were released within 1 year following admission than the proportion admitted during 1916-25 who were released within 5 years following admission. In all periods, at least 50 percent of the patients were released within 5 years following admission. The youngest patients, those aged 15-34 years, have extremely high probabilities of release. Patients 75 years old and over have small chance of ever leaving the hospital.

2. For patients with functional psychoses, the probability of release in the first year following admission in the period 1946-50 was considerably in excess of the probability of release for patients admitted in each of the earlier periods.

*Does this mean that the various therapies used in increasing volume in the most recent period—electroconvulsive therapy, insulin, group psychotherapy, and occupational therapy—have been responsible for this increase in release rates, or have other factors been responsible?*

3. Patients with senile and cerebral arteriosclerotic psychoses have low probabilities of return to the community. Their death rates, particularly in the first few weeks and months following admission, are exceedingly high.

*What are the social, economic, and familial factors responsible for bringing a high proportion of moribund patients into the mental hospital?*

4. Functional psychotics, as well as other categories of patients not released in the first year of hospitalization, experience considerably reduced probabilities of release in the second and subsequent years of hospitalization. Also, patients admitted during 1946-50, who have attained their second and third years of hospital life, have approximately the same chances of being released in the following year as had similar groups of patients in the earlier cohorts of admission.

*What are the etiological and other factors responsible for long-term hospitalization? What treatment methods can be developed to make it possible to return more of these individuals to the community? What can be done to improve the lot of the patient who cannot be returned to society?*



# Appraising Fly Control Programs

Since 1946, the effective use of chlorinated hydrocarbon insecticides in the control of the housefly, *Musca domestica*, and of various species of blowflies (*Phaenicia sericata*, *Phaenicia pallescens*, *Phormia regina*) has led to the establishment of community fly control programs throughout the United States. Experience has shown that successful fly abatement requires a composite approach which includes the development of adequate levels of environmental sanitation, chemical control, community education, and biological evaluation.

The evaluative phase is the subject of this monograph, which discusses the techniques per se and as each is applied in field operations. Most of the data illustrating the advantages and disadvantages of the methods relate to community fly control programs sponsored by the Communicable Disease Center in cooperation with State and local health departments during the period 1948-53.

The evaluation of a community fly control program serves to guide the selection and frequency of the measures employed and to assay their effectiveness. The latter function requires a routine, periodic assessment in contrast to the flexible, variable techniques necessary for guiding the control operations.

The three methods used most commonly to determine adult fly densities are the grill, reconnaissance, and fly-trap techniques. Either the Scudder grill or a reconnaissance type of survey based on the grill provides the most acceptable means of obtaining repeatable, reliable indexes to fly abundance.

For effective surveillance of a municipality, the city should be divided into areas of socioeconomic levels, such as business, high-class residential, and so on, and the sampling coverage should be related to the magnitude of the fly problem within the zone concerned. Evaluation

units of 10 to 20 blocks each are established for grill surveys, 1 to 2 blocks in each unit being inspected weekly. Three types of station blocks are designated: fixed block (block with highest fly potential within the evaluative unit); random block (any block within the evaluative unit except the fixed station block); and problem block (block with extremely high fly potential,



Public Health

MONOGRAPH

No. 33

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Schoof, H. E.: Survey and appraisal methods for community fly control programs. Public Health Monograph No. 33. (Public Health Service Publication No. 443.) 18 pages. Illustrated. U. S. Government Printing Office, Washington, D. C., 1955.

resulting from the presence of a dairy, abattoir, dump, and so on).

Survey data show that prevalence trends for fixed station and random station blocks are similar. However, random station blocks are much slower in responding to any sharp increase in fly prevalence. Because the fixed station block is a more sensitive indicator of the fluctuations in fly densities, it is preferred for operational programs.

Fly traps are less reliable than grill surveys in depicting quantitative trends but give a broader index to the qualitative aspects of the the fly population.

The appraisal phase of a community fly control program must be considered as an integral part of the whole operation. Effective utilization of appraisal methods contributes to more efficiency and economy and, in turn, supports the health of the community.

## PHS films

### Organized Mosquito Control

16 mm. Film, color, sound, 17 minutes, 1955.

Audience: Public health workers and others interested in mosquito control.

Available: Loan—Public Health Service, Communicable Disease Center, 50 7th St. NE, Atlanta 23, Ga.

The solving of mosquito problems on an organized basis is depicted in this film.

Sampling as a first step to determine species present, relative abundance, and types of breeding places are portrayed, as well as dipping for larvae to determine major problem areas, and the spraying of breeding places. Breeding sites are surveyed as determinants of flight ranges.

Three common methods of mosquito abatement are outlined—permanent control through water management, larviciding, and killing adults on the wing or in resting places. In addition, five major types of problem areas—fresh water swamps and depressions, salt marshes, lakes and farm ponds, irrigated fields and pastures, and urban areas—are illustrated. The hydraulic dredge at work, larviciding, and hand and power spraying are shown also.

An efficient manager, adequate funds, capable employees, suitable equipment, and up-to-date records are pointed out as contributing to the success of an organized mosquito control program.

### Mosquito Stages of *Plasmodium falciparum*

16 mm. Film, black and white, sound, 10 minutes. 1954.

Audience: Medical, public health and parasitology students, sanitarians and laboratory technicians, and others interested in the study of living malaria parasites.

Available: Loan—Public Health Service, Communicable Disease Center, 50 7th St. NE, Atlanta 23, Ga.

The appearance and behavior of living malaria parasites within the mosquito host are shown in this film. It depicts the female *Anopheles quadrimaculatus* obtaining a blood meal and the action of the mosquito mouth parts within tissues.

Gametocytes, gamete formation, and fertilization are observed, along with the development of the ookinete, oocyst, and sporozoites. Transfer of sporozoites to the salivary glands and their inoculation into the tissues of the host when the infected mosquito feeds are likewise viewed.

This is a companion film to M 138a "Erythrocytic Stages of *Plasmodium vivax*."

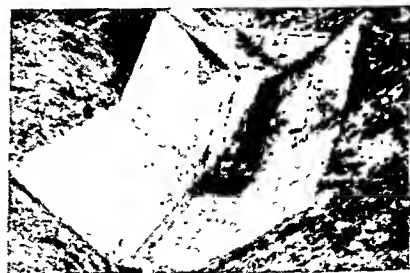
### Mosquito Prevention in Irrigated Areas

16 mm. Film, black and white, 7 minutes. 1955.

Audience: Public health workers interested in mosquito prevention in irrigated areas.

Available: Loan—Public Health Service, Communicable Disease Center, 50 7th St., NE, Atlanta 23, Ga. Purchase—United World Films, Inc., 1445 Park Avenue, New York 29, N. Y.

That it is possible to achieve irrigation without the problem of mosquitoes is demonstrated in this film. It emphasizes that the one cardinal rule for controlling mosquitoes in irrigated areas is to avoid standing water by careful design and maintenance of the irrigation system, by accurate preleveling of fields, and by providing adequate runoff drainage.



A cement water-drainage canal.

The life cycle of the mosquito is shown, and 13 typical locations of stagnant pools or sluggish water where mosquitoes might mature in irrigated areas are illustrated.

# APHA

## WESTERN BRANCH CONFERENCE REPORT

The 22d annual meeting of the Western Branch of the American Public Health Association, attended by 450 representatives from 11 Pacific and Mountain States, 3 western Provinces of Canada, Alaska, Hawaii, and the Philippine Islands, was held in Phoenix, Ariz., April 19-22. Of the papers presented at the meeting, 1 is published in full and 7 others are briefed. Some of the papers are scheduled for publication in full at a later date in *Public Health Reports* or in other scientific and professional journals.

The newly elected officers of the branch are: president—G. D. Carlyle Thompson, M.D., executive officer and secretary, Montana State Board of Health, Helena; president-elect—A. Harry Bliss, associate professor and chairman, department of public health, University of California, Los Angeles; vice presidents—Mrs. Christie T. Corbett, generalized nursing consultant, Oregon State Board of Health, Portland; Robert Dyar, M.D., chief, division of preventive medical services, California State Department of Public Health, Berkeley; J. A. Kahl, M.D., acting State director of health, Washington State Department of Health, Seattle; secretary-treasurer—Mrs. Amy Darter, supervising bacteriologist, division of laboratories, California State Department of Public Health, Berkeley.

The branch will meet next on May 30-June 2, 1956, in Salt Lake City, Utah.

# The Epidemiologist Looks at Smog

By LESTER BRESLOW, M.D., M.P.H.

ORDINARILY, the epidemiologist is confronted with a disease and is asked to determine its source or cause. In the case of smog, he is given an environmental condition and asked to determine whether this causes disease.

When the epidemiologist investigates a particular illness, his first task is to define the illness and its occurrence in time and place. Likewise, when he attempts to ascertain whether smog has deleterious effects on health, the first task is to define smog and its occurrence in time and place. Here the difficulties begin.

Air is perhaps our most taken-for-granted natural resource. During the past several decades, however, city dwellers have become aware of industrial and other air-polluting wastes. Occasionally, as in London, England, in 1952, Donora, Pa., in 1948, and Meuse Valley, Belgium, in 1930, the pollution has become severe enough to result in sudden death to large numbers. A vague apprehension, supported by some evidence, is also arising that prolonged exposure to moderate air pollution may cause insidious, harmful effects or even premature death.

For none of the air pollution disasters mentioned has there been a convincing identification of the substance responsible. Although some investigators have incriminated sulfur dioxide as an important factor, the evidence

is scanty. So when the epidemiologist is called upon to find whether the polluted air of an urban community such as Los Angeles is injurious to health, he really has no good chemical guidelines to pursue. We know that air pollution can kill, but we do not know what substance or combination of substances may be responsible.

In Los Angeles, the people have been increasingly concerned with eye-irritating properties of the air, the loss of visibility, and damage to plants. Smog in Los Angeles is even defined as the quality of air which produces these effects. Thus, a search has been initiated to determine what air pollutant causes eye irritation, decreased visibility, and plant damage. The substantial progress in this direction, however, does not materially aid the epidemiologist who is concerned with more serious effects that may be occurring. The materials which cause eye irritation, for example, may not be the same as those which cause other types of injury to health. Dozens of substances have already been found in the Los Angeles air, and many of these measured. The fact that certain of these are being identified as the factors causing eye irritation does not help to determine whether air pollution in Los Angeles can cause respiratory disease or death. Quite different pollutants may be involved in the latter if they occur.

One might assume the eye-irritating substances to be indexes of air pollution in general. By determining and measuring these substances, we would acquire knowledge on the degree of pollution from any and all substances. This assumption may be highly misleading. For example, the eye-irritating substances appear to be largely dependent upon sunshine. In the event of severe air pollution coincident with severe fog, as in the London episode, the

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*Dr. Breslow, chief of the bureau of chronic diseases, California State Department of Public Health, San Francisco, presented this paper at the April 1955 meeting of the Western Branch of the American Public Health Association. Other papers from the meeting follow in brief form.*

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substances, which are dependent upon solar radiation, might fail as an index at the very time they were most wanted.

Thus, the epidemiologist cannot be content with definitions of smog which are commonly accepted today. He must keep in mind the whole array of air pollutants—lead and other heavy metals, chlorinated hydrocarbons, and many other substances which have been relatively neglected in the attempt to determine the eye-irritating and plant-damaging substances in smog.

Not only do we have trouble defining smog, but we are beginning to realize its tremendous variation in place and time. The soot pollution of certain cities in the eastern United States is vastly different from the pollution of California cities with hydrocarbons and other types of waste. In any one community, for example Los Angeles, the air pollution as reflected in the chemical measures now available differs greatly not only from day to day but even from hour to hour, depending upon meteorological and other factors.

### A Two-Part Problem

However crude his notion of the nature of smog, the epidemiologist still faces the question, does it cause ill health or death? This problem may actually be divided into two parts: (a) Does it cause immediate damage, that is, within a few hours or days; (b) does it cause long-range damage, after exposure for years and years?

To answer the first question one turns naturally to the usual indexes of ill health—excessive mortality, morbidity, and disability. Do any of these occur during or immediately after episodes of smog? At this point, of course, we come back to the vexatious problem, what is an episode of smog? For purposes of our initial investigation of the effect of air pollution on health we had available the results of an aerometric survey conducted by the Air Pollution Foundation at 10 stations in Los Angeles during the months of August through November 1954. We arbitrarily defined an episode of smog as a series of days during which several of the following were noted: Air pollutants such as lead, oxidant, nitrogen dioxide, hydro-

carbons, and carbon monoxide were recorded as present in "high" amounts; adverse meteorological conditions prevailed; and newspaper accounts indicated smog. The records unfortunately did not cover all days during the 4-month period, and correspondence between the various measures actually made was far from perfect. However, inspection of the data did permit the crude selection of three periods of relatively high smog—one each in September, October, and November 1954.

Air pollution disasters characteristically have affected most severely the elderly, and especially those with chronic cardiorespiratory diseases. Hence, our first thought was to determine if smog episodes resulted in excessive frequency of mortality from selected cardiorespiratory diseases among older people. No such effect from the three smog episodes could be found for the Los Angeles population 65 years of age and older. This failure to show any effect on mortality among those 65 and older may be contrasted with a very obvious effect on the mortality of this group by daily temperature fluctuations, which we did note. Further work is being done on this question of deaths among older persons, with particular attention to mortality among those more than 75 years of age and mortality for the several days following the last episode of smog which occurred at the end of November. Analysis up to the present time includes only deaths occurring in November.

We also examined the mortality experience of a group of frail, elderly individuals, such as those found in nursing homes. Sixteen Los Angeles nursing homes with a total of 358 beds reported the number of patients who died each week during the months of August through November 1954. One week of this period, the week immediately following the heavy smog of late October, did show an unusually large number of deaths. However, since the data cover only a limited period, not much significance can be attached to this observation until more work is done to determine whether corresponding rises occur during other episodes of smog.

Inspection of the infant mortality experience during the 4-month period of the aerometric survey gave no indication of any effect from air pollution.



Thus, only the barest suggestion was found that Los Angeles air pollution, during the fall of 1954, actually caused mortality.

In respect to morbidity we studied the findings of a household sickness survey which was being conducted throughout the State by the State health department. Preliminary inspection of the rates for respiratory illness and for illness among older persons in Los Angeles has not revealed any measurable effect from smog during August through November 1954.

If air pollution adversely affects the cardiac and respiratory systems, the proportion of persons admitted to hospitals with certain diagnoses might reflect this relationship. Examination of admission data for more than 29,000 patients in 9 large Los Angeles hospitals during the 4-month period showed no changes in the proportion of persons admitted with cardiac or respiratory diseases which were coincident with smog.

Limited data on industrial and school absenteeism revealed no relationship to the periods of smog.

Examination of available indexes, both mortality and morbidity, did not yield much evidence of a measurable effect on health from Los Angeles air pollution during the fall of 1954. This, of course, is not to say that no effect occurred. It may be that our measuring rods are too crude.

The opinions of Los Angeles physicians, expressed in a mailed questionnaire submitted by the county medical association, overwhelmingly support the idea of an adverse effect by smog upon health. A telephone survey of school administrators and teachers by the Los Angeles Board of Education during the October 1954 smog episode indicated a strong belief that smog was interfering with children's behavior and school performance. The pupils were said to be restless, irascible, and less attentive. Although not quantitative, this type of opinion evidence deserves some attention, if only to indicate the direction of more definitive studies.

### Long-Term Effects

The foregoing discussion pertains only to part of the question, namely the immediate ef-

fects on health. Even though no such effects are measurable, and this cannot yet be stated, one must still consider the question of long-term effects. How does health respond to smog exposure continued year after year? Are there any chronic effects, perhaps of greater import than acute effects? This is a much more difficult question.

Stocks (1) has advanced some interesting evidence that air pollution in English cities may induce various lung diseases including lung cancer. He was, of course, dealing with relatively stable populations, for the most part exposed to one type of air pollution during their entire lifetimes. What may be the long-term results of the tremendous migration to Los Angeles during the past 10 years when air pollution of a different sort from that in England has apparently been increasing? The answer may be several years delayed, but the question is one we cannot ignore.

At least two approaches to the problem of chronic effects may be useful. One is to compare the mortality and morbidity experience of Los Angeles residents with some control group, for example, the residents of another California city. It is difficult to select a satisfactory control group, particularly because of the migratory habits of the population. Another approach is to compare the health experience of Los Angeles residents who have lived in the community only a short time with the health experience of those who migrated there many years ago, and who, consequently, have had longer exposure to Los Angeles air pollution.

Both of these approaches are now under consideration, in addition to further study of the possible immediate effects of air pollution.

In addition to the question of whether smog causes disease, particularly a measurable effect on morbidity and mortality, the epidemiologist may also be asked a related but somewhat different question, namely, is smog a health hazard? To this one may give an unequivocal answer—yes (2), because of its obvious immediate interference with the physical, mental, and social well-being of the people; its possible, but as yet undetermined, cumulative adverse effects upon health; and its disaster-making potential, should pollution concentration build up in any area.

## REFERENCES

- (1) Stocks, P.: Regional and local differences in cancer death rates. General Register Office studies on medical and population subjects No. 1. London, His Majesty's Stationery Office, 1947.
- (2) California State Department of Public Health: Clean air for California. San Francisco, The Department, 1955.

# State Health Councils



The merits and deficiencies of statewide health councils are of considerable current interest to health officers.

These councils are a means through which public health problems may become known and understood and through which citizen support and appropriate, cooperative action may be achieved.

Sound guidance for all health councils is found in the words of Dr. Florence R. Sabin: "Give the people the facts and they can be depended upon to act." That thought guides the public health servants of Colorado in their efforts to promote dynamic health leadership for the entire State.

## Nature of State Health Councils

To describe the composition and objectives of numerous State health councils, let us start with a broad definition. The health division of the Denver Area Welfare Council defines a health council as a State or local federation of groups and individuals organized to plan and jointly promote health activities.

State health councils are now functioning in nearly two-thirds of the States. Usually, according to reports presented to the annual meeting of the National Health Council in 1952, a State council's membership includes statewide organizations primarily concerned with health

or medical services. These include medical and other professional associations in health fields, hospital associations, official health agencies, and voluntary health agencies. Membership may also include interested statewide organizations not directly dealing with health and medical matters. Often the latter type of organizations are associate members of the councils. They should be considered very important, since they show potentialities of being the best channel through which to develop widespread public interest in health needs and activities.

Local health councils are frequently included as associate members of the State councils. In any case, there should be close working relationships with the local councils and periodic State meetings attended by representatives of all the local councils. There are now in the United States about 700 local health councils and 250 health divisions, or committees, that are units of larger community organizations dealing with many civic improvement projects.

Some of the State councils charge annual membership fees; others, including the council in Colorado, leave the amount contributed to the decision of each member organization. Occasionally, a State council has a paid executive director and staff; in other instances, as in Colorado at present, the council's work must be carried forward through services donated by member organizations and, possibly, a paid stenographer or clerk. Necessarily, therefore, the nature and the costliness of the programs that can be undertaken by the councils differ.

In considering possible principal objectives, the following appear to be common to most of the State councils:

1. To educate the council members regarding programs and policies of the member organizations.
2. To serve as a State information center on health programs and problems.
3. To encourage joint planning among health organizations in order to eliminate gaps and overlapping in their programs.
4. To determine statewide health needs, arouse public support for proposed health programs, and promote needed health legislation.
5. To assist in the organization of local health councils, and to guide and encourage

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Colorado State Department of Public Health.

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them in studying local health needs in relation to State programs.

6. To further local health units and other needed local health programs.

### Health Council in Colorado

The accomplishment of health council objectives requires skill in public relations and community organization, a skill possessed in rare degree by Dr. Sabin. A few of her words, taken from a speech in 1950, serve to explain the purpose behind the Colorado Health Council: "We are interested in the organization of permanent health councils on a State basis, with a membership of representatives of all the private health agencies who wish to join. Such an organization is intended to maintain the interest of citizens in aiding, following, and giving constructive criticism and advice to all the governmental agencies."

The Colorado Health Council was organized and incorporated in 1950. Its future seemed assured by more than 20 member organizations, a board of directors composed of more than 40 key representatives of the member organizations, and an executive committee consisting of 6 elected officers of the council and 15 persons elected from the membership of the board. Meetings were held in 1950 and 1951, but, lacking a paid, full-time executive secretary and finding its officers and board members heavily burdened by other responsibilities, the council drifted into inactivity by 1952. It was reactivated at a meeting held by the board of directors in September 1954. Twenty members representing 15 organizations were present and the annual meeting was set for October.

At the October meeting, attended by 21 representatives of 16 organizations, elections of officers were held. Financial contributions toward expenses were urged, and three types of activities were authorized for the next 6 months. The projects are: (a) compilation and distribution of weekly and final reports on the health legislation presented in the 1955 General Assembly of Colorado; (b) compilation and cataloging of information on programs and activities relating to health throughout the State; and (c) review of the health goals set in the 1945-47 studies, together with

an evaluation of the progress made since then.

Office space has been provided by the State department of public health for a part-time secretary-clerk paid by the council. The first two of the projects have been carried forward under the direction of the chief of health education of the department, president-elect of the council. The third project, or progress study, is being made by a medical representative of the Colorado Heart Association, also a member of the council.

It is expected that the three initial activities will serve as a foundation for an expanding program. Council meetings are to be held four times a year, and, presumably, financial support of the council and active participation in its activities by the member organizations will gain momentum. Thus, a new start has been made, but only a start.

In my opinion, the council, if it is to become a major force for adequate appropriations and needed legislation from year to year, should have the following: (a) an executive secretary; (b) closer working relationships with medical society committees and spokesmen; (c) widened associate membership among general service organizations that have an interest in health but who are also recognized as representing a broad range of public opinion; and (d) a central purpose, that of consolidating the support of the member organizations behind needed public health measures, whether or not they relate to a particular member's field of activity. If a united, well-informed stand could be achieved by the council, appointment of an official Colorado Health Council spokesman at the annual sessions of the legislature probably would be desirable and effective.

In addition, it seems to me that the State council could acquire many helpful ideas by holding meetings with representatives of the existing local health councils. In Weld County, Colo., for example, there are numerous community health councils. These compose a larger association called the Combined Weld County Health Council, and the association works closely with the long-established Weld County Health Department. Thus linked, the local and county organizations get the facts to the people in a variety of ways. One method

was the "Health Days," sponsored by the association, held last April 29 and 30, with meetings and exhibits at the State College of Education in Greeley, the principal city of Weld County.

## Mental Health



Nathan Ackerman in a recent article in *Social Case Work* quotes Clifford Beers as stating in "A Mind That Found Itself" the goals of mental hygiene to be:

Encourage reforms in the care and treatment of the mentally ill.

Disseminate public information designed to increase human tolerance for those afflicted with mental illness.

Promote research into the causes, motives, and treatment of mental disorders.

Create services directed toward the prevention of mental illness.

By way of contrast, Albert Deutsch in "The Mentally Ill in America" writes that the aim of some mental health programs is to provide:

"A world of peace and freedom from which the twin spectres of war and insecurity will be banished; a world of equal opportunity where people will be freed from stunting inhibitions and 'guilt feelings' rising from outworn prejudices and taboos; a world where children may lead healthy happy lives and grow into useful well-adjusted citizens; where the personality is permitted to develop maturely and freely, where the individual is given a sense of personal worth and dignity, and where his activities and ambitions are integrated with the development of group life. . . ."

### Negative Effects

The original overselling of Beers' first formulations has produced a sometimes destructive

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By Robert L. Stubblefield, M.D., director, Psychiatric Clinic, University of Colorado School of Medicine, Denver.

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effect on public health thinking and planning. But true mental hygiene ideology cannot possibly be oversold. Rather, as Ackerman points out, some unreal premises—which might better not have been advanced—have been oversold.

For example, one can design a relatively well-defined program in only very few areas of mental health—such as in the prevention of some types of mental retardation by good prenatal health practices. But when one deals with psychoneurosis or with schizophrenia, the principles stated by Beers lead into seemingly insurmountable difficulties:

Should research be in biological areas, psychological and environmental areas, or both?

How can one create a research design to deal with so many variables?

What types of personnel should be trained?

In view of the difficulty in effecting even minor personality changes, what types of public education should be used?

### In the United States

Every health official has some idea about the number of beds occupied in this country by chronic mental patients, particularly those suffering from schizophrenia and senility:

725,000 mental patients occupy nearly half of all hospital beds.

250,000 new mental patients will enter hospitals this year.

1 in every 12 children will spend some time in a mental institution.

Three-fourths of State mental hospital patients have been hospitalized for more than 2 years.

After 2 years, the odds against a patient's being released are 16 to 1.

These figures do not tell us the large numbers of mentally ill who pass through the courts or enter penal institutions. In addition, many pressing public health problems are made more complicated by the nature of the accompanying personality reactions.

### Worldwide in Scope

The development of mental health programs is receiving much attention from the World Health Organization. A WHO committee has described their standard historical development.

Initially, there is mere provision of custody

for grossly disordered individuals. Then, there is provision for refuge in the shape of the insane asylum. Finally, there is the development of specific hospitals for the psychotic and of educational or working colonies for the mentally deficient.

The provision of facilities for the clinical handling of the psychoneurotics proceeds through similar phases.

"It is very probable," the committee suggested, "that the planned application of preventive measures at a stage of a country's development earlier than they tend to develop spontaneously would reduce considerably the need for the great expenditure on therapeutic facilities which otherwise arises as development proceeds."

Integration of psychiatric personnel into a State health program might be of much more value than the traditional development of a new structure in a health unit.

Particularly pertinent to our own western States are other observations of the WHO committee. It felt that the shortage of mental health workers retarded the development of mental health programs, now designed chiefly for urban and industrial areas, and that another great need is to explore the efficacy of such programs in predominantly rural settings.

### Focus on Education

Any preventive program in mental health will be related to an educational process. In my opinion, most of our educational efforts should be concentrated on the individuals who have the most significant health roles with parents and children—on the pediatrician, the general medical practitioner, the public health nurse, and others. We should focus our attention on the child's preschool, kindergarten, and early elementary school experiences.

We have no doubt of the need for accurate early diagnosis of the chronic psychiatric illnesses and suitable therapeutic centers nor about the need for a program of research in normal personality development and the various mental illnesses. We need to explore the value of community mental health centers, such as those recently developed in Massachusetts which devote much professional staff time to

consultation with agencies dealing with chronic psychiatric problems.

Specific problems impede the development of preventive measures in mental hygiene. By tradition and practice, we are focused on the observation, diagnosis, and clinical treatment of an individual. Because of the length of psychotherapy and psychoanalysis we are somewhat skeptical about health education efforts. We have some stereotyped ideas about public health concepts and goals. We tend to discount psychiatric observations about the difficulties in effecting personality change and reorganization.

Public health personnel tend to move into the psychiatric team areas of function rather than to identify and publicize shortages of trained personnel and support research and training programs. But the current interest in these needs and in the development of sound programs is encouraging. I feel that we are on the verge of outstanding new positive relationships between the psychiatric disciplines and public health.

## State-Local Relations



We are all familiar with and use, either consciously or unconsciously, certain principles in solving problems in public health. These principles—in the form of inquiry—are:

- Can the problem be identified or measured?
- Is there a technique which has been proved effective?
- Can this technique be applied on a mass basis?
- Can the results of the mass application of this technique be evaluated?
- Is this technique financially feasible?

These same principles can be applied to problems of State-local relations in public health. One problem is the incomplete or inadequate definition of State and local responsibilities.

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Another aspect of State-local relations is the process of developing opinion regarding the definition of public health. This process also affects certain public health standards—technical, program, personal, financial—which, in general, are nationwide. Some of these standards may be applicable only to local areas; others represent nationwide averages and may be completely inappropriate when applied to a given community.

Recent experiences in California illustrate methods for solving or preventing problems in State-local relations. In an attempt to define the responsibilities of the State agency in public health, each bureau, each service, and each division of the State health department is delineating its activities or the activities in its field of influence under three broad categories: services performed directly by the State agency; services performed jointly by the State and local agencies; and services for which the local agency alone is responsible.

### Techniques

In assisting local areas and agencies, the California State Department of Public Health is using four techniques—financial assistance, program consultation, determination of manpower requirements, and surveys of health needs and problems. All of these can be applied on a mass basis, although some selection may be necessary because of practical limitations of time.

Allocation of funds to local health jurisdictions is based on the population served. Small jurisdictions receive a relatively higher amount per capita than larger health departments. To receive funds from the State, local areas must expend a specified amount per capita per year from their own funds, and the State board of health cannot adopt any standards which a local area must meet unless they are approved by the California Conference of Local Health Officers.

Program consultation is provided by the staff of the State health department. Methods vary and are being improved with experience. Review of local health programs by a team of consultants in several specialties is undertaken at the request of the local health officer. The

method to be used is discussed with and approved by the administrative staff of the local health department before plans are completed and the review is begun. This technique has been completely acceptable to local groups and leads to good State-local relations.

Estimates of manpower needs in sanitation have been made on the basis of existing problems instead of on a simple population ratio. Similar estimates will be attempted in the field of public health nursing and, eventually, for other types of professional and public health workers.

Surveys of health needs and problems in individual counties have been made on request of the counties. Teams of State health department personnel—usually a medical officer, a public health nurse, a health educator, a social worker, and sanitation personnel—visited the counties and compiled statistics and other information available in State and local agencies, made field observations of the environment and situations within the county, and interviewed selected individuals and groups. Upon completion of the survey, information from all sources was pooled and the findings reported.

### Results

As a result of State financial assistance, since 1947, 16 California counties have initiated organized public health programs. No county has abandoned its public health organization. Through the conference of local health officers, a true partnership has developed between local and State agencies, and opinions of persons in the State and local health agencies regarding the team method of consultation service to local health departments indicate that help was received through the use of this technique. Final evaluation, of course, can only be made in terms of measured progress directly attributable to the use of this method. Evaluations of the relation of the State health department and the small rural counties are not complete, but analysis of the effectiveness of these methods and measurement of the results will be continued. The final answer as to the financial feasibility of these techniques can only come after further evaluation of the results obtained.

# The Insurance Carrier



Industrial medicine once was concerned primarily with traumatic surgery or curative medicine, but in recent years the emphasis has shifted to preventive medicine. It is within this sphere that industrial medicine may produce the greatest contributions to health, as well as the greatest economic savings. Modern industrial management has come to realize that health maintenance in industry is good business. By increasing productivity and reducing employee turnover and absences, it brings increased earnings for both employer and employee.

The insurance carriers' contribution to progress in industrial medicine has been a direct outgrowth of their concern with accident prevention which reflected the need for compensating workmen for injuries suffered on the job. Today our loss prevention department employs about 400 trained people, including safety engineers, industrial hygienists, and specialists in such fields as radiation, noise, and applied research, in addition to a sizable medical staff.

Although engineering skills will continue to be important in accident prevention, they cannot control the attitude or reactions of the individual to various situations or conditions. They cannot control the actions of a preoccupied parent worrying about a sick child, an impending divorce, or an insurmountable debt. Nor can they do much to control the reactions or attitudes of one who is under par physically. A good medical program not only aids in accident prevention and occupational disease control, but can bring about marked improvement in the health of employees and their families at home. Thus, in our medical loss prevention department we now have 6 full-time physicians, 2 part-time physicians, and 24 nurses, who ad-

vise and consult with policyholders on all phases of industrial preventive medicine.

The activities of our medical loss prevention department are confined chiefly to the promotion of new medical programs and the evaluation of existing programs in policyholder plants. Recommendations are based on factual data obtained from surveys and studies of the individual plants. In each instance, we attempt to design a program to fit the specific needs of the plant, whether it be a first-aid program, a plant nurse, or a complete medical service. Factors taken into consideration are: number of employees, by sex; median age of employees; type and severity of occupational exposures; absenteeism; labor turnover; job placement procedures; and seniority and health clauses in union contracts.

The recommended amount of physician and nursing time spent in the plant depends upon the number of employees and the severity of occupational exposures. We usually recommend 1 hour of nursing time per day for each 75 employees and 1 hour of physician time per week for each 50 to 75 employees.

## Economic Benefits

One of the primary benefits derived from an inplant medical program stems from better case control of minor injuries and illnesses. Good case control does nothing to prevent injury or illness, but it has a marked effect on the subsequent period of disability and thus reduces compensation and medical costs for the policyholder and the insurance company, as well as wage losses for the employee. Reduction in these costs alone will often defray the expense of the medical program.

For example, in a plant employing 575 people, there were 565 man-days lost because of injury during the year preceding the installation of a medical program, with medical costs for injuries amounting to about \$3,200 and compensation costs totaling \$3,100. During the first year after the medical program was begun, only 168 man-days were lost as a result of injuries. Medical costs dropped to \$1,450 and compensation costs to \$875, a saving of \$3,975. The cost of the medical program was \$2,500.

Direct costs for medical care and disability,

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of course, constitute only a fraction of the total costs of illness and injury. The National Association of Manufacturers has stated that each day's absence costs a plant  $1\frac{1}{2}$  times the daily wage, and surveys have shown that the national rate for absenteeism is 9 days per employee per year. Thus, in a plant employing 500 people at an average wage of \$12 a day, the annual cost of absenteeism to the plant would be \$81,000.

It would be ridiculous to assume that a medical program could reduce absenteeism to zero, but we do have several plants in which a good medical program has been able to reduce the figure by 50 percent or more. Assuming even a reduction of 25 percent, a saving of \$20,250 could be realized in the aforementioned plant from control of absenteeism alone. To this are to be added the savings derived from decreased compensation costs, increased production from healthier workers, and improved morale.

### The Greatest Potential

Savings in workmen's compensation are perhaps the most readily discernible benefits of an industrial medical program, but it is in the prevention of nonoccupational diseases that the greatest economic potential lies. A study by Dr. M. N. Howard, plant physician for the Socony-Vacuum Oil Co., points out the relative importance of the nonoccupational and occupational causes of disability: Of 6,092 man-days lost for medical reasons during 1949, 4.0 percent were lost because of occupational disease or injury; 6.7 percent because of nonoccupational injury; and the remainder, 89.3 percent, because of acute or chronic nonoccupational illness. Acute illness, including the common cold, accounted for 51.1 percent of the lost time, and chronic illness for 38.2 percent.

Establishing a plant medical service essentially for the control of toxic exposures is comparable to limiting service to the care of industrial injuries. Both of these services are important components of a plant medical program, but they do not embrace the broader aspects of modern industrial medicine. A modern industrial medical program should be designed to provide for adequate case control, the prevention of nonoccupational disease as

well as occupational injury and disease, the control of absenteeism and labor turnover, the maintenance of effectiveness of the individual worker, and the improvement of labor-management relations.

## Veterinary Medicine

**PHR** The zoonoses, because of their relationship to disease incidence in man, have gained public health significance for veterinary medicine in the past 10 years.

Twenty-one States and four Territories created veterinary public health divisions in that period, and about 18 States now participate in a program of animal disease reporting.

Cooperation between epidemiologists and veterinarians has concentrated medical attention on many animal diseases which are communicable to man. Furthermore, certain diseases have recently been found to be transmissible to man from animals not previously implicated.

Virus diseases of veterinary public health importance include equine encephalomyelitis and psittacosis. The first is conveyed by birds or mosquitoes to both horses and man, often coincidentally. New questions about the epidemiology and transmission of psittacosis were raised when poultry plant employees developed the disease after contact with domestic turkeys. Preliminary investigations conducted by the Colorado State Department of Public Health suggest that antibody titers for psittacosis may be normal for some fraction of the population. Treatment of this disease with antibiotics temporarily inhibits antibody formation and reduces the number of reported cases.

Following the epizootics of western strain equine encephalomyelitis in Saskatchewan,

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Canada, and the 1941 outbreak there, a test against neurotropic viruses was devised which helps to differentiate between poliomyelitis and encephalomyelitis. Soon after the first equine outbreak, a number of humans evidenced a central nervous disorder which was thought to be nonparalytic poliomyelitis.

What appears to be of utmost significance is the observation that a number of children affected with the western equine virus developed mental insufficiencies—in some cases, within a few weeks after the acute symptoms developed. Pursuit of studies in adults who had been affected with the disease revealed that a high percentage had died, and some had become mentally ill. Saskatchewan public health workers believe that the neutralization test should be used whenever causes of mental change in patients are obscure.

Developments in rabies control include modified live virus avianized vaccines and a hyper-immune serum to be used in conjunction with the Semple series as well as improved diagnostic techniques, such as examination of the gasserian ganglion. Studies of the propagation of sylvatic rabies among insectivorous and frugivorous bats and other wildlife are also in progress.

A 1950 report from the University of Wisconsin tended to support earlier accounts of another virus zoonosis in man. Vesicular stomatitis, once considered peculiar to swine, horses, and cattle, was diagnosed among laboratory workers.

Q fever occurs in man as a result of airborne infection, from consuming unpasteurized milk from infected cattle, and from contact with cattle, sheep, and goats. Indeed, symptomless carriers among livestock are the principal reservoir of Q fever.

Some of the bacterial diseases which may be imparted to man by livestock are leptospirosis, salmonellosis, brucellosis, bovine tuberculosis, tularemia, and anthrax. Leptospirosis and salmonellosis also are carried by several species of animals. The presence of healthy or symptomless carriers of both hinders efforts to define the distribution of these diseases. The number of leptospirosis cases is rising, but a vaccine has been developed, using 1 of the 4 leptospira serotypes which cause the disease in the United

States, and field results are promising. It is possible, too, that a product effective against typhoid and salmonella carriers may become available.

Bovine tuberculosis is responsible for a condition found now and then in children and is usually diagnosed as cervical lymphadenitis. The disease persists despite measures to rid the livestock population of the condition and efforts to maintain the low infection rate of 0.5 percent enjoyed by all States. The current brucellosis incidence rate for United States cattle is 2.6 percent, enough to present a persistent public health threat.

Reports of *Vibrio fetus* in male dairy and farm workers have refuted the assumption that the malady was limited to females.

Continuing research in protozoan, mycotic, and parasitic disease control methods will undoubtedly expand the veterinary share of responsibility for public health and emphasize the place of well-trained public health veterinarians as part of the epidemiology team.

## Questions in Tuberculosis



Within the last 10 years treatment of tuberculosis has changed notably. New surgical techniques have been developed, but more important has been the introduction of new drugs—streptomycin, para-amino salicylic acid, and isoniazid. Although there is still much to be learned about drug therapy, tuberculosis experts generally agree that it has made patients bacteriologically negative more quickly than other treatment, and that it has prolonged life and promoted healing of open lesions.

Our knowledge of tuberculosis as a disease is in a state of flux as a result of the use of these new drugs. They may conceivably have unforeseen influences on some of the indicators of tuberculosis. Does isoniazid make the tuber-

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culosis bacillus nonpathogenic for guinea pigs in some instances? Does isoniazid reverse a tuberculin reaction? What happens if a recently converted tuberculin positive child is treated with this drug? Is it preventive?

There is some evidence that the disappearance of tubercles with drug therapy may not be permanent. If seemingly bacteriologically negative patients leave the hospital after a short period of treatment, or if they are never hospitalized at all, are they conditioned to handle themselves properly in relation to their family? Should institutional treatment be a prerequisite for home care?

### Epidemiological Phenomena

Associated with the developments in therapy, though not known to be the result of the developments, are certain epidemiological phenomena of significance to public health workers. The following data from California, which I believe are indicative of what is happening throughout the country, will illustrate:

Since 1946, mortality has been declining more rapidly than morbidity. Since 1947, mortality rates have declined about 25 percent each year, but morbidity rates have decreased only about 2 percent. (There was an increase in morbidity from 1946 to 1947.)

The age-sex distribution of new cases of tuberculosis has changed. Rates in both sexes in the age groups under 5 years and 5-9 years have increased. This may be due to changes in nomenclature and morbidity reporting practices, but more likely it is because of an actual increase in cases. Rates in men 20-34 years and 55 years and over and in women 20-24 years have declined more than rates in any other age-sex specific group.

There appears to be a greater concentration of cases in terms of source. An abnormally high proportion comes from jails, penal institutions, and mental hospitals.

The total number of cases of tuberculosis reported annually is about the same each year. The number of tuberculosis hospital beds available (for subsidized care) reached a peak in 1952 and has declined about 3 percent since then. But utilization of these beds has dropped steadily since 1951, with a 10 percent drop from

1953 to 1954. At present, 1 of every 5 beds is empty. Data from selected hospitals indicate that the average length of hospital stay is declining, and there is unconfirmed evidence that fewer cases are being hospitalized initially.

### Questions Raised

These epidemiological phenomena raise a number of questions that public health workers must consider if they are to fulfill their responsibilities in the control of tuberculosis. Many cannot yet be answered; many others must be answered in the light of problems and resources peculiar to each public health jurisdiction.

*Indexes of control:* How reliable are reported morbidity and mortality as indexes of what is happening in tuberculosis? Would not the results of periodic tuberculin testing give a better index of infectivity of tuberculosis, and indirectly of the effect of control programs?

*Hospital facilities:* Should we stop construction of tuberculosis hospital facilities? To what use can we put existing facilities as they are no longer needed for tuberculosis? Or can we assume that tuberculosis beds will become available for other uses?

*Case finding:* Is the mass survey outdated? Are surveys of selected groups justified? Should we continue routine X-ray examination of all hospital patients? Should we discard all case-finding procedures except the search for sources of infection by the case-contact investigation method? Can we rely on any single means of case finding?

*Service programs:* What effect does the increased responsibility for the care of tuberculosis patients in the home have on the service programs of public health? Are public health education programs geared to home care rather than hospital care? Are public health nursing services adequate in terms of skill, time, and staff to assume the increased responsibilities?

*Family problems:* How does the family react to the presence of a chronically ill person in the household? How is the increased load for care of the sick member absorbed by the household? Is professional help available to the patient and his family on financial, social, and emotional problems? What provision is made for the pe-

riodic determination of the infection status of children in the household?

*Supervision and followup:* Should followup procedures for the patients treated at home differ from those for the hospital patient? Are the tuberculosis registers providing the greater detail necessary to insure proper supervision of the patient at home?

It seems that present trends in the treatment of tuberculosis are shifting much of the burden from hospitals to health departments. If health departments are to meet their new responsibilities, they must review conscientiously their professional services and administrative procedures to be sure they are adapted to the problems of home care. They must review critically their present activities in order to eliminate the unnecessary and provide time for increased attention to tuberculosis. Additional staff, particularly nurses and social workers, may be necessary. Tuberculosis is a disease of rapidly declining mortality, but our best efforts will be required to erase the final, and most persistent, evidences of it. This is no time to view tuberculosis with complacency.

## Water Treatment Trends



Population growth, urban concentrations, increased consumption of water for cleaning, bathing, and gardening, occasional drought, and industrial uses of water have placed heavy burdens on the water supply. These burdens are greatly influencing water treatment.

Dallas, Tex., last year developed an emergency supply of water from the Red River, 60 miles away. The waterworks people were obliged to work out a solution for the treat-

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*By H. W. Poston, senior sanitary engineer, Robert A. Taft Sanitary Engineering Center, Public Health Service, Cincinnati, Ohio.*

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ment of this water of poor quality without the benefit of an appropriate treatment plant.

### Tastes and Odors

The removal of tastes and odors from water is not at all helped by meager knowledge concerning the causative agents and the lack of definitive terms for describing odors. It is believed that most tastes and odors come from minute amounts of complex organic compounds. Actinomycetes, closely related to bacteria and fungi, are claimed by Silvey to be the source for unpleasant tastes and odors in water. Control over the conditions of reservoirs—keeping them clean and eliminating marginal and littoral vegetation—would destroy the main food sources for these organisms, he states.

The organic compounds recovered in the experimental work at the Robert A. Taft Sanitary Engineering Center are tested in distilled water to reproduce specific tastes and odors.

A musty component in water, probably an ester, has been recovered from the Ohio, Mississippi, and Scioto Rivers and the Great Lakes. Appearing to be of natural origin, it is not thought to be a product of industrial wastes.

### Detergents

Coagulation problems associated with detergents have been reported in many localities. In Kansas, Culp and Stoltenberg found that synthetic detergents present in raw water to the extent of 3.0 to 3.5 p.p.m. would interfere with treatment. Gallaher reported similar difficulties in Wisconsin. Todd in West Virginia experienced foam to a depth of 4 feet on the raw water basin, difficulty in coagulation and settling, inability to remove iron, and failure to remove taste even when chlorine dioxide was increased to 4 times normal.

Langelier and co-workers conducted coagulation studies using sequestering agents such as sodium hexametaphosphate. Smith, Walton, and Cohen recently found that household detergents may cause difficulty in raw water coagulation at water treatment plants drawing on a surface supply. As the use of detergents con-

tinues to expand, their effects must be studied further.

### Filtration

Necessarily, filter rates of over 2 gallons per minute per square foot are used in many plants during periods of heavy demand. Usually, at these times, the water is warm and coagulation problems are minimal. In many plants, water applied to filters meets the requirements of the Public Health Service's Drinking Water Standards insofar as turbidity and bacteria are concerned, owing to good coagulation and chlorination.

Baylis at Chicago, experimenting with filtration rates up to 5 g.p.m./sq.ft., concludes that, for water not high in turbidity and turbid waters properly conditioned, a filtration rate averaging 4 g.p.m./sq.ft., but not exceeding 5, will produce an acceptable effluent. The main reason for setting the maximum rate at 5 g.p.m./sq.ft. is the high initial cost of head occurring at higher rates rather than the passage of flocculated matter through the filter beds.

Jackson, reporting on the Dalecarlia Filter Plant (Washington, D. C.), concluded that water meeting the present standards of chemical quality, turbidity, and bacteriological purity can be produced at rates up to 5 g.p.m./sq.ft. over a range of temperature from 50° to 72° F., provided efficient pretreatment is maintained, superior free residual chlorination is employed, and qualified operating personnel are available. At high rates, anthracite (0.76 mm.) demonstrated more favorable characteristics than did sand (0.56 mm.) with regard to all phases of head loss, flow, and length of run, Jackson concluded.

### Fluorides

Controlled fluoridation now applies to 1,000 water supply systems serving 20 million people. The fluoride content is maintained between 0.6 and 1.2 p.p.m. More than 500 communities are using water which contains a natural excess of fluorides. Pilot plant studies indicate that calcined alumina in contact beds was effective in limiting fluorides to a desirable level with low operating and construction costs. Other ex-

change media that can be used for fluoride reduction include calcium phosphates, anion exchange resins, and magnesium. The selection of a particular medium is based on local conditions, cost, water analysis, and capacity required.

### Water Quality

Methods for determination of bacteriological water quality have not kept pace with the needs. A rapid and accurate technique has long been desired.

The Chicago Department of Water makes use of the electron microscope in obtaining rapid identification of coliform organisms, a method not practicable for most water supplies. The latest edition of Standard Methods of Water Analysis describes a tentative procedure using the membrane filter for enumeration of these organisms. This is essentially the method described by Jeter, Geldreich, and Clark in the April 1955 issue of the *Journal of the American Water Works Association*. By this method only 16 to 18 hours are required for a complete coliform test whereas 24 to 72 hours are required when using the MPN procedure. Large samples of water containing low coliform density can be concentrated by this direct-plating method.

### Civil Defense Needs

Water supply methods for civil defense are not much different from normal objectives. They are merely intensified by large-scale evacuation of heavily populated areas, necessitating additional water supply at emergency evacuation centers. These emergency supplies must be available immediately if evacuees are to be kept from drinking from contaminated sources. Each area has a problem of locating sources prior to any emergency and of providing treatment.

The hazard of water contaminated by radioactive fallout material will not decrease as rapidly as the radioactivity in the water decreases, owing to the fact that the most dangerous of the radioisotopes capable of lodging in the body have relatively long half-lives. It may be dangerous to drink such water long after the

external radiation from fallout has decayed to innocuous levels.

Standard water treatment processes have been found to be of limited value in removing soluble radioactive materials from the water. If the radioactivity is not so closely associated with particulate matter as to be removed with the particles, expensive treatment such as ion-exchange or distillation might be necessary to produce safe drinking water.

Micro-organisms that might be used as biological warfare agents may include pathogenic bacteria, fungi, rickettsiae, viruses, and protozoa. These might be disseminated by the enemy in air, water, food, or by any other route that would permit the BW agent to reach the oral and respiratory tracts, or to penetrate the skin.

According to Berger and Stevenson, a BW attack may not be accompanied by readily detectable changes in the physical characteristics of the water. They say that substantial free

chlorine residuals in important segments of the distribution system represent the best current means of protection—which may not be complete, however, under all possible circumstances. Current routine bacteriological water quality examinations are not useful in detecting the presence of BW material.

Chemical warfare agents are considered less attractive as intentional water contaminants than a number of biological agents. Nerve gases, among the most toxic chemicals known, are one or two orders less toxic than some of the BW agents. Their toxic effects are felt promptly. The Army has developed and tested methods for removing nerve gases from water. Kits are available for detection of various chemicals in water.

The possibility that unknown chemical agents may be available may revise this estimate of a lack of serious threat to water supplies from CW agents.

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## PHS Advisory Council Appointments

**Dr. Joseph F. Volker, Dr. J. Roy Doty, and Edward Y. Blewett** were appointed October 1, 1955, to 4-year terms on the National Advisory Council, National Institute of Dental Research. Upon recommendations of the council, which is composed of 12 men outstanding in science, education, and public affairs, the Surgeon General of the Public Health Service awards grants to dental schools, universities, and other non-Federal institutions conducting research on diseases of the mouth and teeth.

Dr. Volker, president-elect of the International Association of Dental Research, is dean of the School of Dentistry and director of research and graduate study, University of Alabama Medical Center. Formerly professor of clinical dentistry and then dean, Tufts College School of Dentistry, from 1942 to 1948, at times over the past 9 years he has served as dental consultant to Czechoslovakia, Germany, Thailand, and Jamaica.

Dr. Doty is secretary of the Council on Therapeutics, American Dental Association,

with which he has been associated since 1943. He is the 1954 recipient of the distinguished alumni award of Monmouth College, Monmouth, Ill., from which he was graduated in 1927 and where he instructed in chemistry for 3 years. He was also associated with Louisiana State University School of Medicine, first as instructor and later as assistant professor of physiology. He is the author of numerous scientific articles.

Mr. Blewett has been dean of the College of Liberal Arts, University of New Hampshire, since 1939. In the preceding 12 years he served in numerous other posts at the university, as assistant to the president, alumni secretary, director of the summer session, and executive secretary of the university. He is a member of the executive committee of the New England Association of Colleges and Secondary Schools and in 1948 and 1949 was chairman of the arts and sciences' division, Association of Land Grant Colleges and Universities.

*An experience in interprofessional team action directed toward rehabilitation of the adult poliomyelitis patient.*

## Social Considerations in Patient Management

By GEORGIA B. TRAVIS, M.A.

ANY prolonged illness which takes the young adult from his vocational preparation, from breadwinning or homemaking, and places him in the unaccustomed role of patient obviously makes great realistic and psychological demands upon the individual and his family. The degree to which equilibrium is disturbed depends on the interrelationship of several factors, namely, the nature of the illness, the age and personality of the patient, and the manner and degree of family and personal disruption created by the absence of the patient.

Medical management can determine, in part, whether the disturbance will prove catastrophic, leading to permanent, almost total, destruction of normal satisfactions for patient and family, or whether it will prove temporary, altering the pattern, yet not destroying the groundwork, for constructive living. Furthermore, the ability of the patient to utilize medical care to the maximum will depend on how adequately his

social needs are met. These are the reasons why hospital personnel are concerned with social needs.

We are especially alert to what we learn from working with any group of long-term patients because each experience becomes potentially valuable in planning the chronic disease programs of tomorrow. A focus on rehabilitation obviously will be necessary in these programs if they are to be constructive and no more expensive than necessary. Rehabilitation-slanted efforts require interprofessional team action, a method more easily praised than implemented and dependent for its success on medical leadership.

At Colorado General Hospital, a part of the University of Colorado Medical Center in Denver, the application of the multidisciplinary approach over approximately 10 years in working with poliomyelitis patients has yielded certain observations. Some may have wider applicability.

The hospital is small, having only 300 beds. It is tax-supported, and the only private patients there are those under circumstances of special need. The cost for these poliomyelitis patients, all adults, is paid by the National Foundation for Infantile Paralysis. This organization not only has made possible the financial support of the patients but also has aided the teaching activities. It has encouraged a team approach and naturally evolved.

Dr. Winona C.

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the poliomyelitis unit, and, later, of Dr. James Stephens, the present director.

### The Patients' Problems

In poliomyelitis the sudden onset, the need for isolation, the uncertainty regarding extent of paralysis, the respirator care in bulbar cases, and the community fear or panic during an epidemic create certain characteristic problems during the early stage. Later arise the problems connected with family, school, or job disruption, and anxiety as to the degree to which affected parts will respond to treatment.

Still later, among the dwindling group who remain in the hospital, arise the difficulties from monotony and vegetation, from the adjustment to being relegated to the status of uninteresting chronic cases after a dramatic period of great attention, from very deep fears about the future, and from competitive anxiety upon seeing other patients make faster gains.

Finally, whether patients with residual paralysis go home early or late, they have the problems of being discharged home crippled to a greater or lesser degree, to carry on with medical recommendations, and to take up the task of competing with normal people in the outside world.

Despite their similarity, each problem varies according to the patient. Let us look, for example, at what the sudden transition from full activity to respirator status meant to three individuals.

One patient, the mother of six children, one of whom was an infant, said that as she lay in the respirator all she thought about was that she had left the house for the hospital with only one bottle of formula mixed ahead for the baby. No one else in the family knew the formula.

Another patient said that one of his wife's best friends had died in a respirator 2 years previously, that he thought he would die and knew that his wife thought so too. His main concern was getting his mother to come from another State before his wife went to pieces.

The third patient, a waitress responsible for the support of her little girl, had been rushed to the hospital before she could make plans for the child. Because she could not speak, we did not even know of the child's existence until the

landlady telephoned that the little girl had no shoes. The mother could only shake her head and cry when the child was mentioned.

To need to depend for one's breath on something outside one's self is, indeed, the ultimate in dependence. It is not strange, therefore, that the patient who is rushed to an iron lung from the excessive activity which so often seems to precede onset is anxious about yielding up his life to the efficiency of a machine. The fear induced by even the rattle of an uneven caster is familiar to us.

This common reaction is highlighted by the feelings of a patient who unfortunately was in a respirator with faulty hatches which occasionally blew open, lowering the pressure so that he could not breathe or cry for help. The respirator was repaired as soon as the problem was discovered, but during his entire period in an iron lung the patient lay in a state of tension, listening for the clickety-clack of the hatch, particularly during the graveyard shift when a nurse came in the room only every 15 minutes. He said that he knew he would be dead 14 minutes if the hatch went out the minute after she left. The patient was actually traumatized by his experience and still has a lack of confidence in the chest respirator.

During the acute period of poliomyelitis the patient's uncertainty regarding the extent of paralysis which will develop is another common form of distress. Patients tell us that they wonder whether they will wake up the next morning with another limb paralyzed. They describe nightmares of finding they cannot move at all.

One pretty woman, who felt insecure with her husband and who relied on her charms to hold him, had facial paralysis so that her eye and mouth were drawn down and she could not manage her tongue. She was horror-struck over her appearance. When she asked the physician how much farther the paralysis would go, he told her honestly that he did not know. She later described her anguish over what would happen next. She told her husband that he did not need to visit a "monster," and he told us that she offered to get a divorce.

Isolation adds its problems to the acute stage. During the period of fear, distress, and regression which illness brings, the patient needs the



warmth and reassurance of his family. Complete isolation not only sharpens his distress but heightens the family's panic. The physicians here have greatly lessened the number of overwrought patients and relatives by permitting relatives to come to the patient's door during the isolation period.

### **The Value of Social History**

Lack of space prohibits describing the damage poliomyelitis causes to family ties and the reasons for a gradual deterioration of the patient's morale. Our concern in this discussion is how to prevent the panic and worries and family damage of the early stage, with their concomitants of irritability and uncooperativeness, how to obtain the earliest possible hospital discharge, how to prepare the patient for adjustment to his handicap constructively when he goes home. We have not found all the answers, and we do not always put into effect those we do know. However, there are certain things we have learned to do or not to do, and these I will describe.

From the beginning the patient must be understood as an individual and treated accordingly. Although the initial social history obtained from family members and the patient is often far from conclusive, it does afford a base from which the hospital team can proceed. Therefore, the history should be taken within the first few days after admission.

The nature of the epidemic slants the initial histories in that above all else the hospital beds must be kept cleared during the height of the season, and, if most of the patients are improving rapidly, we must know which of them has a suitable home to go to, which patients might be eligible for another hospital, and those patients for whom community planning must be begun immediately if the bed is to be released as soon as the patient is medically ready. Because time is too limited during these early days to permit individual exchanges of information among members of the team, regular conferences are held for all professional personnel. Pertinent information is shared at these conferences, and the plan for the patient's immediate future is decided.

The initial history provides information

about the physical setup of the home and an estimate of the capacities of the family to provide convalescent care and make arrangements for outpatient supervision and physical therapy. In addition the social history gives the medical social worker information about urgent family problems which she needs to take care of so that the patient is not needlessly harassed. The history provides an understanding of what the patient is worrying about. This insight will help personnel deal considerably with irritable or demanding behavior. If the worries are, as they so often are, about the patient's own condition or treatment, the informed physician can clear up the patient's misapprehensions and gauge his interpretations accordingly. Attention to the patient's problems and fears lessens the trauma of poliomyelitis to the patient. It makes him realize that the institution is genuinely interested in him and, therefore, that he can relax and trust the staff. Through the lessening of the patient's anxieties, the demands upon medical and nursing personnel become a little less.

### **Sensitivity in Management**

The administration of the hospital vitally affects meeting the patients' social needs. For example, installation of a telephone system, which made it possible for patients to talk to their relatives, proved to be a most constructive measure in reducing worries. Relaxation of visiting hours permitted a great degree of personal security for patients and relatives. Secretarial service for group conferences, facilitating a flow of abstracts to local referring physicians and discharge recommendations to local health and welfare departments and national foundation chapters, helps to assure the continuity of care which is so essential but so difficult to maintain at a time when it is even more difficult than usual to handle routine paperwork.

The management of transferring patients to another hospital deserves special mention. The pressure for beds and of time tempts making a hasty arrangement in which the patient has not shared. The patient receives an abrupt reminder of his powerlessness over his own destiny if he is notified that an ambulance will take



him to another hospital within a few hours. Other patients, identifying themselves with their departing companion, may greatly resent their own helplessness.

This is the kind of destructive experience which leads to an eventual apathy or a sense of futility. Fearfulness over being moved, even into another ward, is evident in both adults and children with long-time disease and can only be accounted for by the transference of former associations of security to the particular bed or ward or respirator in which the patient is lying.

It is difficult for the patients who remain in the ward to see their former co-patients get better more quickly and leave. The interim months after the peak of the epidemic, when patients having some residual paralysis go home or transfer to another hospital, are particularly trying in several ways. This period coincides with the time when the nurses who arose to the emergency become bored with enemas and baths.

From the standpoint of the patient's mental health, expressions of hostility are welcome, and griping is not discouraged. However, as hostility is so readily attached to immediate objects, the nursing service and the food receive the greatest impact. The physician and the nurse in charge have a great responsibility of interpretation to the staff members who are in the direct line of fire.

While the physician and head nurse are coping with these problems, the medical social worker and the occupational therapist can also be of help to the patient. By getting the patient to talk out his feelings and by listening with understanding, the medical social worker can give support to the patient who despairs about his future. Encouraging the patient to use his good extremities in constructive occupation, which happens incidentally to work off some anxiety, and devising activities that will take the patient's mind off his troubles are among the contributions of the occupational therapist at this time.

Group recreation is very important although we are providing it in only a limited way. Until the advent of television, movies were the patient's first choice. Movies were so desired that our patients have taken up collections

among themselves to rent films in order to supplement the movies the hospital has been able to provide. Television now provides the most important outlet for escape from reality. Religious services have proved of great benefit to some patients, as have the individual visits of the chaplain and the ministers. Volunteers who provide either group entertainment or individual friendly visiting have also been of real value.

When the long pull sets in for the badly handicapped patients, the hospital encourages families to take patients home for weekends or holidays. These patients are given passes to leave the hospital as soon as their physical condition permits. This policy of weekend and holiday leave requires substantial sacrifice from nursing personnel because the patient must be dressed and undressed at odd hours, often the busiest or least staffed times of the day.

Although the patient longs to go home, his first visit especially may be very difficult. For the first time, he goes up his own sidewalk and stairs as a cripple, rather than as a fireman or an electrician striding home for supper or as a mother with her arms full of groceries. However, the gradual adjustment to the outside world during hospitalization makes the eventual discharge much less difficult for the patient and less fearsome for the family. The trips outside have helped break the monotony. Most of all, they have helped the patient remain part of the family group.

The feeding of patients who have paralysis of the upper extremities is another management problem bearing on the patient's eventual adjustment. And more, it is a practical problem of no small magnitude. The patient should be fed when the tray arrives. Like being moved without warning, for one to lie watching the hot soup grow cold and the grease congeal around the meat is a dismal reminder of complete helplessness. To be fed like an infant is bad enough.

### **Planning Vocational Rehabilitation**

Early vocational rehabilitation planning is another constructive measure which can be employed. The mills of vocational rehabilitation grind slowly so that aptitude testing and initiation of forms and counseling service need to be

set in motion early. Doing something or reading something which the patient feels is directly related to earning a livelihood after discharge brings much stronger motivation than activities which are busy work or amusement.

Furthermore, the successful vocational rehabilitation of the handicapped person is the greatest single process in restoring his means of earning money, having a daily occupation, and usefulness to his family, thereby achieving self-esteem and the respect of others. The remarkably ingenious talents of the physical therapist and the occupational therapist can be made to count if the occupational goal of the patient has been established long before he leaves the hospital.

### **Patient-Physician Relationship**

Of all the measures which are employed to sustain and develop the morale of the long-term patient, an almost intangible one, but calling for deliberate action, is that termed supportive help. Morale is basically a matter of self-esteem. A philosophical maturity not ordinarily encountered in the young is required before people are capable of separating the value of personality or self from that of the beauty and usefulness of the body. The equating of physical worth with personal worth must be broken down if the patient is to value himself sufficiently to make the tremendous efforts which are and will be required of him.

We are indebted to those who have worked with other diagnostic groups, notably cancer patients, for the knowledge that one can help a patient make the separation of inherent value of body and personality by utilizing the knowledge that most people place upon themselves the value that other people place upon them. If, by the actions and attitudes of others, a patient is made to know that he is a valued human being, worthy of sustained consideration and interest, it does much to lessen his feeling of worthlessness. All hospital personnel do contribute, positively or negatively, to the patient's attitude toward himself.

The physician's role is particularly significant. The patient may be especially attached to a particular nurse or physical therapist, and it is the medical social worker's special job to

give the patient support. However, there is no one who has the meaning to the patient that the physician has. The doctor's small acts or words take on far greater importance to the patient than even the doctor may realize. In a teaching hospital this may pose a problem more serious than is readily apparent. The chronic patient lacks medical interest, and the intern or resident or staff physician who was so interested in him when he was acutely ill now may pass him by.

The change of resident physicians or transfer of the patient from an internist to an orthopedist, although intellectually comprehended as part of the system, may actually seem to the patient desertion by his most cherished friend, although the word "friend" does not connote the combination of dependency, veneration, and desperate hope which go into a paralyzed patient's feelings about his doctor. Knowing perhaps the reasons for the casualness which social workers sometimes display in transferring patients to other workers, I am aware that the physician may feel embarrassed or think he is being egotistical to consider how much he means to the patient. The doctor may not realize that it is not he as an individual but rather what the patient has vested him with that makes him so important.

The value the physician seems to set on the patient becomes to the patient a measure of his own worth. Because the patient must sustain a feeling of personal worth if he is to strive, the efforts of our sensitive physicians in going beyond the line of duty to show their continuous interest in the patients have been of immeasurable value.

### **Planning for Discharge**

Discharge planning for the badly handicapped patient must be begun a long time before the patient is to leave. Suitable housing will be the most difficult need. If the patient will require a nurse, there must be room for her in his home. Arranging for a housekeeper or practical nurse is a time-consuming task. Financial resources usually cannot be secured quickly. The patient's long-time participation in working out details with the worker and his family helps his adjustment to the frightening

matter of leaving the haven of the hospital. The long planning also helps the family ready themselves psychologically. Severe disruption in family life can take place during the long absence of one member. If this has not been prevented or if it has been augmented, as sometimes happens, discharge may be very difficult to work out.

With a respirator patient particularly, obtaining and financing equipment may be another long-time matter. Any hospital without a medical social worker is practicing poor economy in respect to discharges because the majority of patients and families must have help in planning and carrying out discharge arrangements. Finally, it should be said that hospital discharge merely ends one phase of the patient's social needs. Before he leaves our care some professional person or persons in his own community must be found to help him with the difficult problems that lie ahead.

In conclusion, our goal with poliomyelitis patients is to send them home as quickly as possible and to send them there as fit as possible to meet the problems which await them. To do this, we must try to understand the patient as an individual and to adapt medical management accordingly. Social needs warrant not only the concern and activities of the medical social worker but the joint effort of the entire hospital staff as well. This joint effort is promoted by regular conferences in which all concerned with the patient's treatment share information about and decide on plans for his individual care. Our common effort is directed toward reducing worry, preserving family strength, reducing reminders of helplessness, providing mental stimulation, encouraging gradual adjustment to the outside world, sustaining the individual's belief in his own worth, and promoting early vocational and discharge plans.

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### **New Aramite Tolerance**

The Food and Drug Administration announced on October 3, 1955, a permissible tolerance of 1 p.p.m. of the pesticide chemical Aramite for 19 food crops.

The tolerance level applies to apples, blueberries, cantaloupes, celery, cucumbers, grapefruit, grapes, green beans, lemons, muskmelons, oranges, peaches, pears, plums, raspberries, strawberries, sweet corn (kernels, but not forage), tomatoes, and watermelons.

Commissioner George P. Larrick said no residue of the pesticide, however, would be permitted to remain on forage crops such as alfalfa. This is in line with FDA's policy that milk should be kept free of any pesticide because of its dietary importance to infants and invalids.

The tolerance level was set under a new law requiring the Department of Health, Education, and Welfare to determine what amounts of pesticide residue can safely be permitted to remain on food crops.

*"Medical and social advances toward substituting treatment for the punishment of problem drinkers have not been matched in politics and in law."*

## Legislation and Alcoholism

By JULIUS ISAACS, J.D.

THE report of the Committee on Public Health of the New York State Bar Association (1) points up again the legal implications of public health practice applying to alcoholics. In understanding alcoholism, great progress has been made in the last 15 years. The affliction, now considered a major health problem, it is felt, can be treated successfully in many instances. Differences as to its nature and treatment do not prevent the accumulation of a body of knowledge which will help restore to health many whose lives are threatened by this disease. We must frankly concede that we do not know all the answers, but we have indications that we can find the right track.

We are learning to distinguish between alcoholism and problems associated with drinking that may be merely casual however toxic may be the concentration of alcohol in the blood. Such a distinction is essential if the courts, the physicians, and the social services are to prescribe appropriate treatment. There is no blanket definition, diagnosis, or treatment to

be applied to people who drink "too much": people who drive a car with a few drinks in them; psychotics who drink; homeless men who become drunk; criminals with a taste for liquor; or divorced people who occasionally tittle. People with liquor on their breath, no matter how frequently they are in trouble, cannot all be lumped under the convenient label of alcoholics. To ignore the many distinctions among drinkers is to invite practical objections from judges, police, or anyone else who must cope with these persons.

Psychiatrists, social workers, Alcoholics Anonymous, and others will be the first to protest that techniques which have proved successful with certain well-defined kinds of drinking problems are of little avail in others. While we shift slowly from the traditional attitude that drinking should be punished to the modern view that addiction to alcohol should be treated as an illness, we cannot free the sane drinker from legal or moral responsibility as if he were a victim of a virus. The drinker with a problem, as distinct from the problem drinker, is not suffering from a disease of alcoholism. If, in the paragraphs that follow, the portrait of alcoholism is not always in sharp focus, it is because so much confusion persists between the drinking problem and the problem drinker. But a modern program for dealing with alcoholism, as well as with other social problems associated with drinking, will help public health and legal institutions to refine their concepts and tailor their practices to the patient.

Alcoholism, in the sense that it is an obses-

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sion, is a major social tragedy. Compulsive in character, progressive in its damage to the alcoholic, his family, and the community, it exacts a costly toll. In "skid row" sections, in courts, jails, and city hospitals, we find the visible alcoholics, about 20 percent of the total number. The invisible majority, with no record of arrests or hospitalization, are hidden in offices and homes. Most of these refuse to acknowledge their condition, even to themselves, until the very last stages.

In penthouse or slum, the affliction strikes both genius and dullard, male and female (6 men to 1 woman). Most of the male alcoholics are in the prime of life, 85 percent being between the ages of 35 and 55. The alcoholic's life is curtailed by 2 to 12 years. The incidence of divorce is much above normal; 16 percent of the married male alcoholics are divorced and 25 percent separated. In New York City magistrates' home term court, 70 percent of the cases involve excessive drinking (2).

Alcoholism's annual toll of wage loss is estimated at half a billion dollars. The National Safety Council considers \$120 million alcoholism's annual contribution to preventable accidents. Attributable relief costs are \$22 million. Hospitalization for injuries and incarceration cost \$56 million. A good guess of the total enormous private and public cost to victims and society is well over a billion dollars a year (3).

Nevertheless, few States or cities have laws or procedures that provide for treatment and rehabilitation of the compulsive drinker. In trouble, his usual fate is a term of "reform" in prison. Medical and social advances toward substituting treatment for punishment of problem drinkers have not been matched in politics and in the law.

It is hardly practical to look upon prison to "reform" the parade of drunkards that passes before a police court. Park benchers, alms solicitors, and disorderly persons as well as workmen on a spree may be among the derelicts. Honest seamen temporarily on the beach and out-of-work longshoremen mingle with hopeless down-and-outers and periodic dipsomaniacs. Indiscriminate suspended sentences or short jail terms are futile for the chronic alcoholic. It is impossible even to separate the cele-

brators from the addicts. The defendants come before the judge in such numbers that he may not have time even for routine questions. As a first step, we need screening facilities to determine which defendants are in need of medical care and hospitalization. Adequate information, obtained before arraignment, would give judges information for proper disposition of cases. By such a procedure, confirmed alcoholics may be taken off the streets and committed to an institution for treatment if the legal mechanism for commitment is available and the legal criteria for commitment satisfactory.

### **The Hart Island Experiment**

In a short-lived attempt to establish in August 1950 on New York's East River a place where a defendant might come for rehabilitation on a voluntary basis rather than go through the court's revolving door, New York City had a partial screening process. Here a special institution for handling homeless men whose problems were largely those of the indigent alcoholic was being created. These unfortunate people could voluntarily seek welfare department rehabilitation at Hart Island in preference to a correction department's jail. There was no compulsion to stay for any specified time. But one who left in less than 10 weeks could not return, and a suspended sentence might be executed. Medical care (including free eyeglasses and dentures when necessary), religious guidance, social therapy, Alcoholics Anonymous aid, vocational training, and job placement service were accorded to all. The rehabilitation program was humane, effective, and economically administered. It was a fruitful alternative to costly, barbaric, and useless successive jail sentences for those "offenses" which is society's label for the illness of alcoholism. Everybody had to work, selecting his job from the hundred or more work assignments for the operation and maintenance of the institution. Carpentry, electrical, laundry, kitchen, and dining room skills were on the way to being revived. With alcohol unobtainable, work to do, good food, recreation, and companionship, a change was soon noticeable. Weekly meetings of Alcoholics Anonymous helped in the struggle.

Resident employment counselors were there to obtain job referrals.

Since homeless men, such as those at Hart Island, rarely seek treatment and are afraid of being questioned, they are difficult to study. Accordingly, there is little scientific information about them as a group and their relation to alcohol. It was the recognition of this factor that led to the solicitation of the cooperation of the Yale Center of Alcohol Studies, which established a pilot study on the island.

The Yale center was not able to complete its work, for in the summer of 1954, because an increase in crime was held to require more jail space, Hart Island was overnight taken away from the New York City Department of Welfare and given to its Department of Correction. Thus, this potentially useful project ended before it was really on its feet. Whatever the needs of the correction department, the action eliminated a hopeful step in the treatment of alcoholism in New York.

In less than a 4-year period the widely heralded experiment at Hart Island appeared to offer a constructive approach. Since the experiment seemed to be sound in conception and efficient in operation, the Hart Island facilities were to be extended to include those who were not homeless but were willing to pay for rehabilitation there. It had been planned also to seek a State grant and a city budgetary appropriation for the creation of a halfway house to break the transition from the protected life at Hart Island to the competitive problems faced by the "alumni." This halfway house was to provide meals, lodgings, and recreation at cost in a controlled resocialization project until the Hart Island "graduate" had had a reasonable time to become secure in a newly achieved self-reliance—a self-reliance mixed with a dependence on an institutionalized way of life from which he must be freed at an individual pace. The Hart Island experience, as well as a somewhat similar project for study of homeless men sentenced to the Monroe County jail (conducted by the University of Rochester sociology department), might have provided the evidence needed to guide and obtain legislation for civil commitment to other nonpenal treatment facilities for wider varieties of the alcoholic sick.

This is the background to the note of disappointment implicit in the report of the New York State Bar committee. To explain that disappointment further, it is useful to make a brief survey of the history of legislation on the subject in New York.

### Legislative Steps

New York State's progress toward enacting a sound alcoholism program has been slow. The penal law in force in 1897 provided: "Any person intoxicated in a public place is guilty of a misdemeanor, and may be arrested without a warrant while so intoxicated." In 1911, the words "is guilty of a misdemeanor" were deleted, eliminating such offenses from a category of "crime" (4). However, these persons were still subject to arrest in a lesser category of offense, such as disorderly conduct that annoys others. In order to resolve any ambiguity, the New York State Legislature amended the penal law in 1955 to provide that a person intoxicated in a public place may be arrested without a warrant while so intoxicated. If the charge is sustained and the person found guilty, he is deemed to have committed an offense. The amendment (ch. 823, L. 1955) makes proof of annoyance to others unnecessary. The arrest gives the magistrate original jurisdiction. But the problem still is what to do with an alcoholic when he comes before the judge.

In 1910, the inferior criminal courts act gave New York City the power to establish a board of inebriety and hospital and industrial colonies for the publicly intoxicated. In 1911, the State's general municipal law (secs. 136-139b) provided for boards of inebriety by localities outside of New York City. These sections have just been repealed (ch. 133, L. 1955) since no city operated such a colony, and the administrative provisions of the law are out of date.

In 1911 at Warwick, a hospital and colony was established by the New York City Board of Inebriety. With the enactment of prohibition in 1920, the board was abolished and the colony closed. The board's first report was the only one filed. Its functions were transferred to the New York City Department of Correction, again a step back to punishment. That department has taken no action except to receive

at Riker's Island some alcoholics sentenced there on a variety of charges.

New York's education law (sec. 804) provides for the compulsory teaching in schools of alcohol's evil effects. Its mental hygiene law (sec. 201) permits a judge of a court of record to commit an "alleged inebriate" to a private licensed institution for mental disorders on application of his family, a relative or friend, an officer of a charitable institution, a public welfare officer, or the inebriate himself. The physician in charge of the institution must present his consent in writing. In addition two examiners must certify that the subject is incapable of conducting himself or his affairs properly or is dangerous to himself or others by reason of frequent drunkenness, whether induced by alcohol or drugs or other intoxicating substances. The certificate must show that he is in actual need of special care and treatment and that his condition is such that his detention, care, and treatment would be likely to effect a cure. The section provides that a person so certified or a relative or friend may, within 30 days, apply for a review of the order of certification to the State supreme court. A jury then passes upon his inebriety. Private institutions have been unwilling to assume the responsibility for consenting to such commitments for fear of false-imprisonment suits. In addition only the rich could afford the cost of institutional care.

Under the present New York State law only psychotics may be retained and treated in State mental hygiene institutions. Haggard and Jellinek (5) have defined psychosis as insanity or mental disease. They report that only a small proportion of men who drink to excess develop alcoholic psychosis. Although psychosis is not a common occurrence in chronic alcoholism, certain changes in personality which cannot be called insanity do eventually occur in most chronic alcoholics. The authors state that in about 1.5 percent of chronic alcoholics the deterioration of conduct becomes complicated by uncontrolled rages, delusions, or other disturbing symptoms. The condition is then designated as chronic alcoholic deterioration with psychosis. The psychotic inebriate is segregated in mental institutions, and in that way society takes care of him. But the nonpsychotic inebriate at present gets attention from society

only when he comes into conflict with the law. It is his illness which presents us with our primary challenge.

The world has been slow to consider the chronic alcoholic as a sick person. It has been slower still to concede that the alcoholic does not voluntarily choose the road to ruin. When the problem became acute, some localities "solved" it by jailing, some by exiling to other communities, and others by closing their eyes to the existence of any problem. From time to time, public opinion became aroused over these illusionary "solutions" and demanded action. It disturbed the community that arrest and jail were so expensive in money and lives. Finally, came a realization that here was a social problem better dealt with by appropriate social agencies than by police and prison. It was the social effects of alcohol that brought about the recognition of the need for committing alcoholics to treatment clinics rather than to jail.

In December 1948, the first clinic was established at the University of Buffalo, and the Edward J. Meyer Memorial Hospital set aside 20 beds for the treatment of alcoholic patients.

Through the efforts of the Medical Jurisprudence Committee of the Association of the Bar, the New York County Medical Society, and the New York City Academy of Medicine, the Rosenblatt bill was introduced in January 1949 providing a full-scale program. It called for the establishment of a bureau of alcoholic rehabilitation in the New York State Department of Mental Hygiene to study the causes, extent, prevention, control, and treatment of alcoholism and the rehabilitation of chronic alcoholics. To be established and equipped were hospitals, clinics, and custodial institutions or farms either in connection with other facilities for the diagnosis, classification, hospitalization, confinement, and treatment of alcoholics or independently. The bill also provided for the voluntary admission of alcoholics and the civil commitment of alcoholics to approved institutions by the courts. It was not reported out of committee.

In October 1949, the same groups proposed a bill creating a New York State Commission on Alcoholism along the lines of the Connecticut State Commission, directed to establish and operate information centers and clinics and to



arrange with existing hospitals to receive alcoholics for short-term treatment. It also provided a simple procedure for voluntary admissions and court commitments of alcoholics to hospitals, to the commission itself, and to members or groups of Alcoholics Anonymous. This bill was never introduced. Some objected that extensive additional facilities for long-term commitment of alcoholics were needed. So further time was wasted.

In 1952, the same interested groups retreated to the position of requesting simply a temporary commission to study the problem and report to the legislature. This time the objection was that the subject had been investigated enough and what was needed now was action. Finally, on March 31, 1952, a first step was achieved in the enactment of the Mitchell-Ten Eyck bill, ch. 354, L. 1952. It provided that the Commission on Mental Health in cooperation with the State departments of health and mental hygiene formulate a program to provide for the diagnosis, treatment, and rehabilitation of chronic alcoholics by public and private community agencies and authorized a study of the problems relating to alcoholism in conjunction with such a program. Appropriations aggregating \$145,000 were made to carry out the purposes of the bill—\$100,000 for services and \$45,000 for research.

Under this bill the local government has primary responsibility for initiating and operating the services on a matching 50-percent basis for the cost of operation. The State supplies in addition consultant and supervisory services.

### **New Clinical Services**

Modest progress has been made in setting up a number of outpatient clinics under the program, but these are not open to voluntary patients. The University of Buffalo Alcoholic Rehabilitation Center, opened in 1948 as previously mentioned, expanded its work under the program in association with the Meyer Memorial Hospital. Another clinic, in addition to the one opened in 1949 at the Rochester Health Bureau, was established in the Rochester City Hospital. The University of Rochester sociology department is making a penitentiary re-

search study of men committed to Monroe County jail. New clinics were set up in Syracuse, in Binghamton, at the New York State University College of Medicine on Long Island, and in the home term court of the New York City magistrates' court. Further clinics in New York have been proposed.

Under the dollar matching by local resources, New York State's expenditure for clinical services from March 1952 to March 1954 was \$42,499; an additional \$27,305 was spent for research and administration. The 1955 allocation for services is \$69,303 and for research, \$39,458. It is possible that too much of the clinical service is research-motivated, but, if so, that is in line with the purposes of the legislation.

### **Recommendations**

In the light of this history, the New York State Bar Association's committee report, which evoked this discussion, recommends: (a) that the State's program be expanded and accelerated; (b) that hospitals be encouraged to provide treatment facilities, medical schools provide research and training, and qualified medical personnel participate in and advance the program in closer cooperation with voluntary agencies for group therapy; and (c) that a keener awareness be aroused in local governments and health institutions concerning their responsibility for establishing and operating adequate facilities for rehabilitation.

For those who seek more specific guidance, these are the recommendations offered in 1947 by the Research Council on the Problems of Alcohol:

1. Problem drinkers suffering acute physical or mental damage should be admitted to general hospitals, mental hospitals, or other institutions.
2. Mental hospitals should accept directly or by referral from general hospitals symptomatic problem drinkers, that is, the psychotic. Farms and industrial colonies should be established for seriously deteriorated problem drinkers who have physical or mental damage.
3. Custody and care of alcoholics should be transferred from the police to public health agencies.
4. Facilities for treatment should be estab-



lished in the hospitals affiliated with medical schools so as to permit research and training of personnel.

5. Thoroughgoing research should be made into the causes, mechanism, and possible cures for alcoholism.

Support is warranted especially for the following recommendations of the New York State Bar Association: arrest, treatment, or punishment where over-use of alcohol is a factor; examination of the relationship to automobile accidents of over-use of alcohol by driver and pedestrian; acceptance of insurance companies of alcoholism as an insurable risk; more public education.

The New York State Bar Association attributes a want of fulfillment in the field of alcoholic rehabilitation to lack of medical interest and a failure of localities to initiate badly needed facilities. But the legal profession shares responsibility for a solution with every other available profession, organization, or agency, State and local, government and private. The failure to move cannot be ascribed alone to the local section for "a heavy share in the snail's pace of the attack on alcoholism." If New York City must accept full responsibility for the Hart Island action, so, also, must State legislators, hospitals, and physicians acknowledge their own obligations. The State's function must be spelled out. Selden D. Bacon says (6): "That the State has a responsibility to fulfill in the control of alcoholism as an extensive public health problem is a belief which has spread widely in recent years." This should not be open to question however broad may be the disagreement on the legislation proposed.

There appears to be a broad distribution of obligations of leadership in government. In the first instance, the State may bear the duty of legislating a full-scale program, although in many States the leadership may come from a few progressive towns. Whether or not they exercise initiative and leadership, cities and counties share in building a program. When State legislation is enacted, the localities can do their part more readily. The cost may be shared but that does not relieve the State of developing leadership which is centralized and

firm rather than haphazard and dependent upon the uncertain direction in which individual localities move. In this social program, society is equated with the State. Many States have accepted such responsibility, going from simple surveys to well-established programs. Examples of well-integrated programs are found in Connecticut, Virginia, and Wisconsin.

### 10-Point Program

As a basis of discussion, the following 10-point program is offered with particular regard for the potentials of a rich State with broad resources.

**1.** Set up screening facilities in classification centers staffed by physicians, social investigators, probation officers of local departments, welfare workers, correction and police officers, and court officials. Start here. Identify. Examine. Diagnose. Give the data to the judge. Screen out the chronic alcoholics and take them off the streets and into institutions.

**2.** With the aid of screening material, the judge could usefully release some on probation on condition that alcoholics with a chance of rehabilitation go to the outpatient clinics such as those established under New York's Mitchell-Ten Eyck law. Make these clinics available to persons voluntarily seeking help and correlate them with the screening facilities.

**3.** Activate institutions such as the short-lived experiment at Hart Island.

**4.** Educate personnel in correctional institutions about the handling and treatment of alcoholics through inservice training programs and select more specialized personnel.

**5.** Set up a followup system to reduce jail repeaters. Cooperation among public health authorities, the Salvation Army, and Alcoholics Anonymous may save duplication in this respect. This system will provide case histories for screening facilities for clinics and courts.

**6.** Establish public farms on a self-supporting basis. They are cheaper than urban jails. Those who can afford it should go to private farms. Many States have established such farms with State and local aid. Although this point is the center of much controversy, my personal conviction is that the system is valid.

It seems to me that farms and industrial colonies are essential for seriously deteriorated problem drinkers and those needing long-term treatment. California has established a State colony. The Hart Island colony of New York City's East River was showing success. Although the Connecticut farm was closed in 1941, the report to the governor declared the idea sound (6).

Such institutions have distinct advantages. They isolate patients from congested areas; they eliminate the possibility of running down local metropolitan sections; they have a lower capital and operating cost than county or city jails or hospitals; they provide better moral and physical rehabilitation possibilities; and they afford opportunities to revive farm and other skills.

Haggard and Jellinek (5) state, "Hospitals or farms for inebriates must be equipped to classify the various types of inebriates according to the causes of their condition." Hirsh (7) says, "When we have learned to utilize our present facilities we might then go on and consider the construction of new ones, such as farms and industrial colonies for seriously deteriorated drinkers who present special and particularly severe problems of treatment and rehabilitation."

7. Empower judges to deal with persons having an alcoholic problem beyond their control under a civil rather than a criminal statute. Even rehabilitation-minded magistrates are now handcuffed to penal statutes.

8. Ultimately there must be a civil commitment procedure. When colonies or farms are set up, procedures can be established for commitment to these institutions on a voluntary and involuntary basis. Many States have commitment laws. In 1951, Georgia provided for both voluntary and involuntary commitment of alcoholics for treatment. In Connecticut, the probate court may commit a habitual drunkard or dipsomaniac or persons so addicted to the intemperate use of narcotics or stimulants that they have lost the power of self-control. California law allows commitment of alcoholics who are unable to transact ordinary business or who endanger themselves or so impoverish themselves as to require charitable aid or who are in danger of becoming degrading or detrimental

influences upon their families or others. The longest, most successful program and the best facilities for dealing with the program and treating the alcoholics are found in Sweden, where there are places for voluntary treatment and for court commitment.

For New York State, the principle of compulsory commitment of alcoholics to privately licensed institutions was affirmed under section 201 of the mental hygiene law. But principle is not practice. The principle of commitment should not depend on ability to pay the high cost of private treatment. Nor should it be thwarted by the private institution's legitimate fear of a suit for false imprisonment.

9. We know what to do. Bridge the gap between what we know and what we do. Should expense be thrown up as a blockade to action, money must be provided by imaginative budget makers. Many States have done it, some by allocating a percentage of liquor license fees to separate administrations for rehabilitation.

10. In the meantime, general hospitals must admit drunkards suffering acute physical or mental damage. Mental hospitals must accept psychotic problem drinkers.

The legal and health system of the State must be prodded into accomplishment so that it will not fail in this crucial problem. We must care to cure.

#### REFERENCES

- (1) Report of the Committee on Public Health, New York State Bar Association. *Proc. New York State Bar A.* 78: 367-375 (1955).
- (2) Reports and recommendations submitted to the board of directors of the Welfare and Health Council of New York by its Committee on Alcoholism. *Better Times*, December 5 and 12, 1952.
- (3) Hirsh, J.: Alcoholism, a neglected malady. *New York Times Magazine*, April 10, 1949.
- (4) *People v. Waters*, 153 Misc. 686, 275 N. Y. Supp. 864.
- (5) Haggard, H. W., and Jellinek, E. M.: *Alcohol explored*. Toronto, Doubleday, 1942.
- (6) Bacon, S. D.: New legislation for the control of alcoholism. *Connecticut law of 1945*. *Quart. J. Stud. on Alcohol* 6: 188-204, September 1945.
- (7) Hirsh, J.: *The problem drinker*. New York City, Duell, Sloan, and Pearce, 1949.

*Deserving of wider recognition is the relationship between marine animal life and water conditions in harbors, bays, and estuaries into which industrial wastes and domestic sewage are discharged. A step in this direction is this study of the Los Angeles and Long Beach Harbors.*

# The Relation of Polychaetous Annelids to Harbor Pollution

By DONALD J. REISH, Ph.D.

NO EXTENSIVE investigations of the role of animals in areas of marine pollution have been carried out in waters of the United States, although there have been a few European studies of interest (1-3). Blegvad (3) has stated that some species of polychaetes flourish well near domestic outfall sewers in Copenhagen Harbor. Filice (4) was able to divide the bottom fauna into three zones in a polluted arm of San Francisco Bay.

The seasonal and quantitative aspects of the relationship between bottom-dwelling animals and pollution in a bay or harbor has not been studied previously. This study, which was undertaken in 1954, examines these seasonal and quantitative aspects and seeks possible indicator organisms or animal associations.

At this time only representative material is published to indicate some of the general findings about the relationship of benthic polychae-

tous annelids to zones of pollution in Los Angeles-Long Beach Harbors. Emphasis has been placed upon the polychaetous annelids since they were the bottom-dwelling animal forms most commonly encountered in the 1951 harbor pollution survey conducted by the Los Angeles Regional Water Pollution Control Board (5).

## Materials and Methods

Los Angeles and Long Beach Harbors are one harbor oceanographically. For convenience of discussion in this study, the harbors have been divided into inner and outer harbors. The outer harbors are considered generally to be the area south of Terminal Island (see map).

Many types of wastes are discharged into these harbors. The sources of these discharges have been described in the report (5) of the Los Angeles Regional Water Pollution Control Board No. 4. They may be grouped into the following seven general categories: fish canneries; oil refineries; chemical plants; vegetable oil plants; creosoting and pile-treating plants; metalworking shops, repair shops, and shipbuilding yards; domestic sewage.

It is important to distinguish between the dictionary definition of the word "pollution" and the California legislative definition of pollution. The dictionary definition, which is em-

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*Dr. Reish, research associate, department of biology, University of Southern California, has been studying the biology of estuaries, bays, and harbors since 1950. Because the complete data of the 1954 survey of Los Angeles-Long Beach Harbors are too voluminous to be included in this general summary, they will be published in monograph form.*

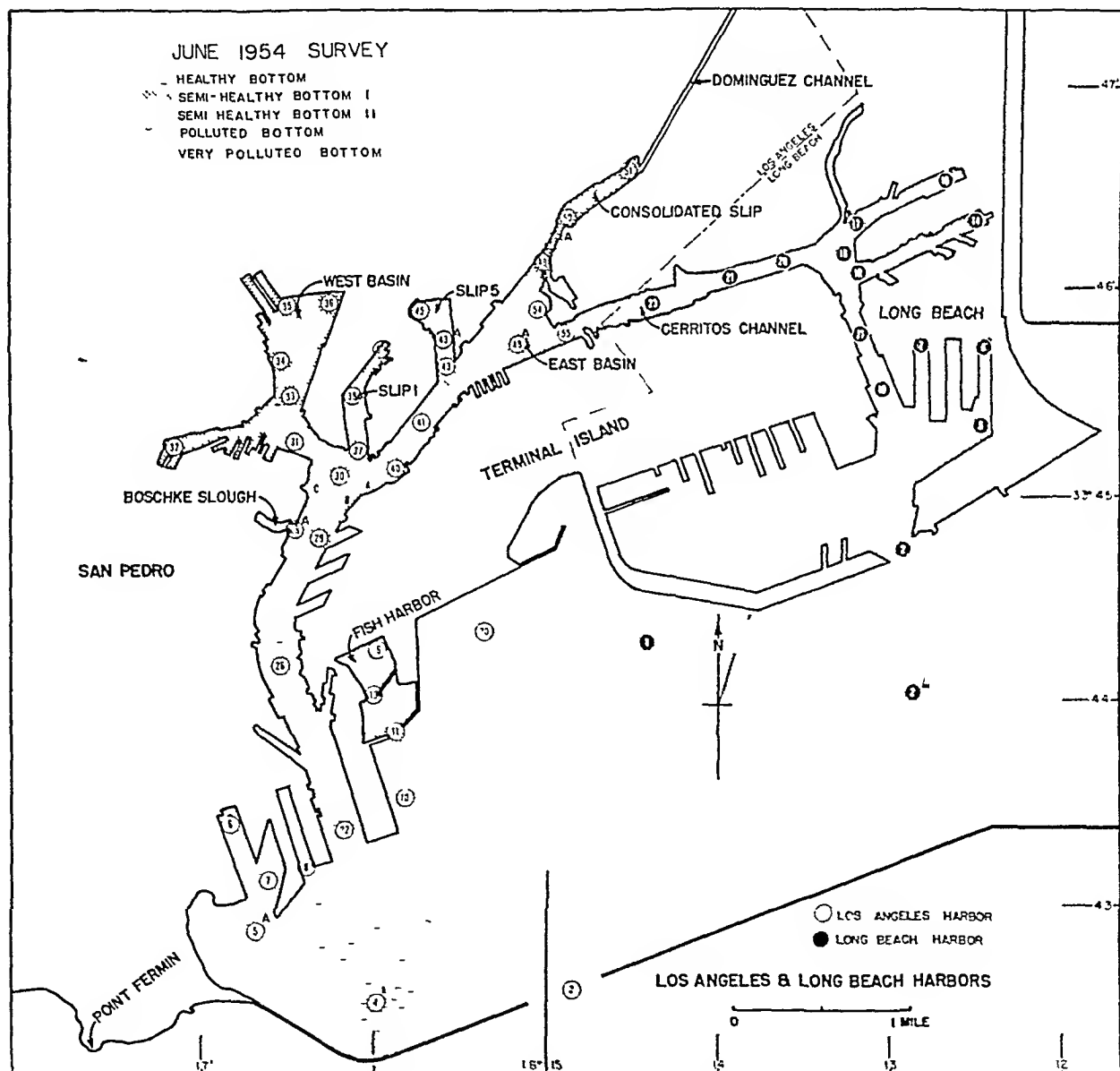
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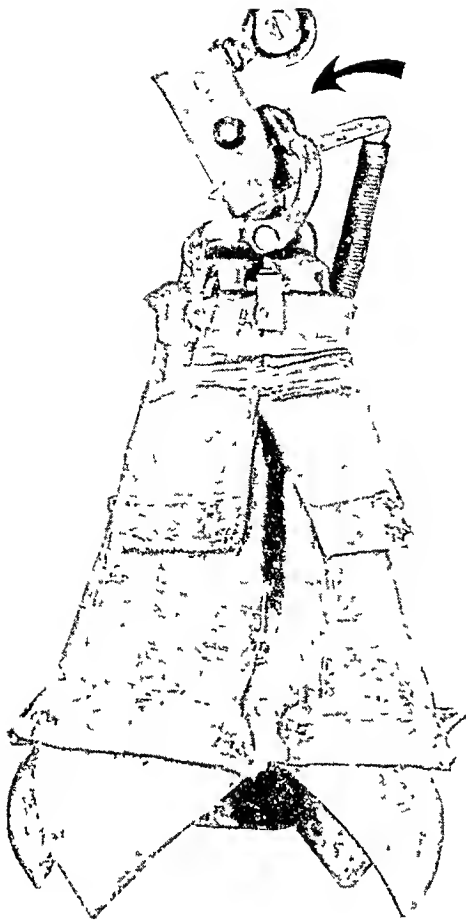
ployed in this study, is the act of making or rendering unclean, whereas in division 7 of the water code of the State of California, under which the State and regional water pollution control boards operate, pollution means "an impairment of the quality of the waters of the State by sewage or industrial waste to a degree which does not create an actual hazard to the public health but which does adversely and unreasonably affect such waters for domestic, agricultural, navigational, recreational or other beneficial use."

Three surveys of the harbors were made dur-

ing 1954; the first was on January 6-7, the second on June 14-15, and the third on November 18-19. In each survey the water mass and substrate at 55 stations in the harbors were sampled as to physical, chemical, and biological characteristics, with the assistance of the Los Angeles Harbor Department and the California State Department of Fish and Game. The sampling stations were in much the same location as the stations described in the 1951 survey (5). The station numbering system used in 1954 follows that of the earlier survey; however, not all of the 1951 stations were used and

Bottom conditions in Los Angeles-Long Beach Harbors, June 1954.





Courtesy of Dr. John L. Mohr.

The trigger (arrow) is set on this No. 1 size Hayward orange-peel bucket used in the pollution surveys of Los Angeles and Long Beach Harbors.

some new stations were added. The stations within Los Angeles Harbor are designated LA-2, LA-4A, and so on (shown as stations 2 and 4A in white circles on the map), and stations within Long Beach Harbor are LB-1, LB-2, and so on (shown as 1 and 2 in black circles).

Samples of the water mass taken at the surface and at a 20-foot depth were analyzed for dissolved oxygen concentration, chlorinity, and pH. One bottom sample was taken at each station with a Hayward orange-peel bucket (pictured). The bucket samples an area of 100 square inches and, depending on the nature of the material, holds as much as a gallon.

Part of the sample material was set aside for later determination of carbon and nitrogen content. The remainder was screened through a wire mesh with 20 openings to the inch. This size of screen was convenient to use since it re-

tains the animals and enables screening to be done in the work boats at the station. The material retained on the screen was preserved in formaldehyde. More details about methods are described in the pollution study Reish and Winter (6) made of Alamitos Bay, Calif.

### Distribution of Animal Species

Insofar as possible, identification of the bottom-dwelling animals has been completed for the January and June 1954 surveys. Seventy different animal species have been identified: 45 species were polychaetes, 10 were pelecypods, and 5 were gastropods; and the remaining 10 species included coelenterates, turbellarians, nemerteans, oligochaetes, crustaceans, phoronids, and echinoderms.

The distribution of the polychaetes was plotted and correlated with bottom conditions in Los Angeles-Long Beach Harbors. On this basis the harbors can be divided into 5 ecologic areas, categorized below as healthy bottom, 2 types of semihealthy bottom, polluted bottom, and very polluted bottom. The zones of pollution, which of course varied for the three surveys, are shown on the map of the June 1954 survey. The physical, chemical, and biological characteristics of samples taken from the five areas are shown in table 1.

The white areas in the channel and harbor portions shown on the map did not fall into the categories of pollution for varying reasons:

Most of the outer harbors and that part of the channel between sampling stations LA-26 and LA-29 were not sampled.

Although the areas at stations LB-10 and LB-11 were sampled, dredging operations were recently completed.

The animals found in the sample from station LA-54 were atypical with reference to other sampling stations.

### Healthy Bottom

The healthy bottom zone was characterized by the polychaete species *Tharyx parvus* Berkeley, *Cossura* sp., and *Nereis procera* Ehlers. The zone was found in both Los Angeles and Long Beach Harbors and in much of the inner harbor of Long Beach.

Table 1. Physical, chemical, and biological characteristics of samples of each of the 5 ecologic areas based on surveys of bottom conditions in Los Angeles and Long Beach Harbors

Characteristic	Healthy bottom <sup>1</sup>	Semihealthy bottom I <sup>2</sup>	Semihealthy bottom II <sup>3</sup>	Polluted bottom <sup>4</sup>	Very polluted bottom <sup>5</sup>
<i>Dissolved oxygen</i> (p.p.m.)					
Surface-----	7.3-----	3.6-----	4.5-----	8.4-----	0.0-----
Deep-----	7.4-----	4.4-----	3.6-----	6.6-----	2.3-----
<i>Chlorinity</i> (0/00)					
Surface-----	19.4-----	19.2-----	19.4-----	19.3-----	19.0-----
Deep-----	19.5-----	19.3-----	19.2-----	19.6-----	19.7-----
<i>pH</i>					
Surface-----	Not taken-----	7.5-----	7.4-----	7.6-----	7.7-----
Deep-----	do-----	7.5-----	7.6-----	7.6-----	7.6-----
Substrate-----	do-----	7.0-----	7.5-----	7.5-----	7.1-----
Nature of substrate	Gray mud-----	Black sulfide mud.	Black sulfide mud.	Black sulfide mud; 3 qts. fish scales.	Black mud; petroleum odor.
<i>Animals</i> <sup>6</sup>					
Polychaetes-----	<i>Tharyx parvus</i> (18) <i>Cossura</i> sp. (11) <i>Nereis procera</i> (2) <i>Scalibregma inflatum</i> (1) <i>Prionospio pinna</i> (2) <i>Lumbrineris minima</i> (3) <i>Amphicleis scaphobranchiata</i> (2)	<i>Polydora paucibranchiata</i> (13) <i>Neanthes caudata</i> (9) <i>Dorvillea articulata</i> (7) <i>Lumbrineris creola</i> (1) <i>Capitella capitata</i> (2)	<i>Cirriformia luxuriosa</i> (272) <i>Polydora paucibranchiata</i> (7) <i>Dorvillea articulata</i> (4) <i>Neanthes caudata</i> (1) <i>Capitella capitata</i> (1)	<i>Capitella capitata</i> (53) <i>Dorvillea articulata</i> (8) <i>Podarke pugtensis</i> (1)	None present.
Pelecypods-----	<i>Tellina buttoni</i> (3)	<i>Tellina buttoni</i> (5)	<i>Macoma nasuta</i> (3)		
Coelenterate-----	<i>Stylatula clongata</i> (1)				
Crustacean-----		<i>Epincbalia</i> sp. (1)			
Unidentified-----	Nemertean (1) Ophiuroid (1)	Oligochaetes (4)	Phoronid (1)		

<sup>1</sup> Station LB-1, January 1954. <sup>2</sup> Station LA-30B, June 1954. <sup>3</sup> Station LA-29A, June 1954. <sup>4</sup> Station LA-16, June 1954. <sup>5</sup> Station LA-49A, June 1954. <sup>6</sup> Figures within parentheses indicate number of specimens present in 1 sample.

An average of 10 animal species were present; 7 were polychaetes.

The dissolved oxygen content of the surface water and of the water at 20 feet averaged more than 6.0 p.p.m.

The substrate was typically a fine, gray-colored mud.

#### *Semihealthy Bottom I*

Two apparently distinct semihealthy zones exist principally in the main channels of Los Angeles Harbor. The main difference is in the type of animal life found: the differences in the physical and chemical characteristics of these zones were minor. The first of these semi-

healthy bottom areas was marked by the presence of *Polydora* (Carazzia) *paucibranchiata* Okuda and *Dorvillea articulata* (Hartman).

An average of 7 animal species were found; 5 were polychaetes.

The average dissolved oxygen reading of the water was 2.5 p.p.m. at the surface and 3.2 at 20 feet.

Fine mud, shell fragments, sand, fish scales, or black mud possessing a sulfide odor were among the variety of substrate types observed.

#### *Semihealthy Bottom II*

The recognition of a second semihealthy zone was occasioned by the presence of large num-

bers of the polychaete *Cirriformia luxuriosa* (Moore). This species of polychaete is particularly noticeable since it frequently attains a length of 15 centimeters, as measured in preserved condition. Otherwise, the number of animal species present, the chemical and physical characteristics, and the nature of the substrate were essentially the same in this second semihealthy zone as in the other semihealthy bottom area.

Sampling station LA-29A is given in table 1 as an example of this zone, which was found only within a portion of Los Angeles inner harbor. However, the 272 specimens of *C. luxuriosa* listed for semihealthy bottom II is unusually high. A more typical number would be around 80.

### *Polluted Bottom*

The areas of polluted bottom were characterized by an average of 3 animal species, 2 of which were polychaetes. One of the polychaete species, *Capitella capitata* (Fabricius), was always present and frequently in large numbers. Fishery wastes or domestic sewage was being discharged near the sampling stations where the largest numbers of *C. capitata* were found. The polluted bottom zone was found usually within the slips except in the outer harbors where it was found on two occasions about the Terminal Island outfall sewer and on one occasion near the Fish Harbor outfall sewer.

Both at the surface and at 20 feet, the average dissolved oxygen content of the water was 3.5 p.p.m. This concentration was higher than that observed for the two semihealthy zones.

The substrate was a black mud with a sulfide odor.

### *Very Polluted Bottom*

No animal life was present in the very polluted bottom areas, which are characterized by sludge beds. Sludge beds are an accumulation of toxic waste discharges to such an extent as to have killed the organisms living in the bottom and to exclude the introduction of organisms from other areas.

The inner reaches of some of the slips in the harbors had a very polluted bottom, but the areas in which no life existed were not observed in the main channels or in the outer harbors ex-

cept once during the November 1954 survey near the Terminal Island outfall sewer. The sources of pollution may be of domestic origin or of industrial origin, from oil refinery wastes for example.

The dissolved oxygen content was an average 1.6 p.p.m. at the surface and 2.2 p.p.m. at 20 feet below the surface.

The substrate consisted of black mud which had either a sulfide or petroleum odor.

### **Descriptive of Actual Conditions**

While the general designation of the harbor bottom zones as healthy bottom, semihealthy bottom, polluted bottom, and very polluted bottom is based in part on the distribution of the different species of bottom-dwelling animals, notably the polychaetes, this terminology, adapted from Patrick (7), is employed because it is more descriptive of the actual conditions than are the scientific names of the principal species. Each type of bottom is characterized by one or more species of polychaetes, which, within limits, may serve as indicator organisms.

The division into zones may suggest well-defined demarcations, but frequently this is not the case with regard to animal distribution. Species characteristic of the healthy bottom are found in smaller numbers within the two semihealthy bottom zones but not within the polluted bottom area. *C. capitata*, the characteristic organism of the polluted bottom, may be present in the semihealthy bottom, but it has not been found in the healthy area. Animals common in the semihealthy bottom may occur in the healthy or polluted areas but again only in smaller numbers.

The most common areas of overlap occur either near the junction of two bottom types or at stations that were not well defined as to type of bottom from survey to survey. The area in slip 5 is an example of overlapping zones. The zone surrounding station LA-45 was classified "polluted" in the January and June surveys and "semihealthy I" in the November survey.

Since a relationship exists between the polychaete population and the degree of pollution in the waters they inhabit, a knowledge of the more prevalent species of polychaetes is desirable. Comparative lengths and ecologic char-

acters of the principal bottom-dwelling species of polychaetes of Long Angeles-Long Beach Harbors are given in table 2, which also includes geographic distribution and references to published material describing the species.

### Seasonal Distribution

Little seasonal variation in the distribution of the animals was found during the three 1954 surveys. In general, the results of this aspect of the study are similar to the findings of the 1951 survey. Some variations are worthy of mention, however.

In 1951 the very polluted bottom zone extended into the East Basin of Los Angeles Harbor to about the level of station LA-54. The sludge beds characterizing this area in 1951 were removed in 1953 when the East Basin and a portion of the consolidated slip were dredged in order to deepen the Dominguez Channel for shipping. Although animals were found in the bottom area around stations LA-49, LA-49A, and LA-50 in the January 1954 survey, no animals were taken from these stations in the June survey. By November the sludge beds had again advanced into the East Basin to include station LA-54.

Checking upon the enroachment of sludge beds into previously productive biological beds is of particular importance to water pollution control. *C. capitata*, which was particularly

abundant near regions of pollution of biological origin in the Los Angeles-Long Beach Harbors, has been found elsewhere in southern California bay areas:

Reish and Winter (6) found the animal in two different areas of Alamitos Bay. One area is in the vicinity of a public dump, but the other is not near any known source of pollution.

Unpublished data yields the information that *C. capitata* is also present in the lower San Gabriel River, which receives waste discharges of both industrial and domestic origin, and in Newport Bay, too, where it has been found only near fish cannery outfall sewers.

Additional data relating *C. capitata* to pollution is given by Filice (4), who found the animal near industrial and waste discharges in San Pablo Bay, an arm of San Francisco Bay. The further correlation of *C. capitata* with sources of pollution, particularly of biological origin, would be of value.

Comparisons of the fauna and bottom of the Los Angeles-Long Beach Harbors with those of Alamitos Bay (6) and Newport Bay are of interest since these bays are essentially unpolluted bodies of water in southern California, except as noted. The animals in Alamitos Bay and Newport Bay are diversified and similar to those found in the outer harbors of Los Angeles and Long Beach.

Recently, Hartman (8) published the preliminary results of a quantitative survey of the

**Table 2. Comparison of the ecology, length, and geographic distribution of the principal benthic polychaetes in Los Angeles and Long Beach Harbors**

Species	Type of bottom <sup>1</sup>	Length <sup>2</sup> (cm.)	Habitat	Geographic distribution	Reference list
<i>Tharyx parvus</i> .....	Healthy.....	2.5	Burrows in substrate.	Vancouver Island, San Francisco Bay, Southern California.	8, 9, 10.
<i>Cossura</i> sp.....	do.....	1.5	do.....	Southern California.	Undescribed species.
<i>Nereis procerca</i> .....	do.....	9.0	do.....	British Columbia to California.	11.
<i>Polydora</i> (Carazzia) <i>pau-ribranchiata</i> .	Semihealthy..	1.5	Builds mud tubes.	Japan, California.	6, 12.
<i>Dorvillea articulata</i> .....	do.....	2.0	Crawls on surface of substrate or burrows in substrate.	Oregon to western Mexico	13, 14.
<i>Cirriformia luxuriosa</i> .....	do.....	15.0	Burrows in substrate.	California.	10.
<i>Capitella capitata</i> .....	Polluted.....	3.0	do.....	Cosmopolitan.	9.

<sup>1</sup> In Los Angeles and Long Beach Harbors.

<sup>2</sup> Maximum observed length of preserved specimens.



benthos of the San Pedro Basin—the area between Los Angeles-Long Beach Harbors and Santa Catalina Island. Two of the 5 stations sampled within the 2 harbors have been analyzed. These two stations were located near stations LA-4A and LB-1. A Hayward orange-peel bucket was used to sample an area of 2.8 square feet. Although the number of specimens and species was greater, as reported by Hartman, the results indicated a healthy bottom condition with *T. parvus* predominating.

## Summary

A physical, chemical, and biological study of 55 sampling stations made 3 times during 1954 in Los Angeles-Long Beach Harbors, Calif., placed emphasis upon bottom organisms, particularly the polychaetous annelids. As a result of the survey, the harbors can be divided into five zones on the basis of bottom conditions and distribution of polychaetes. The zones are:

A healthy bottom area characterized by a large number of polychaete species, with *Tharyx parvus*, *Cossura* sp., and *Nereis procera* predominating.

A semihealthy bottom area, with *Polydora* (Carazzia) *paucibranchiata* and *Dorvillea articulata* predominating.

A second semihealthy bottom area in which *Cirriiformia luxuriosa* predominates.

A polluted bottom area, with *Capitella capitata* predominating.

A very polluted bottom area in which there is no animal life.

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## REFERENCES

(1) Alexander, W. B., Southgate, B. A., and Bassindale, R.: The survey of the River Tees. Pt. II.

The estuary, chemical and biological. Water Pollution Research Board Tech. Paper No. 5. London, Water Pollution Research Board, 1935, 171 pp.

- (2) Bassindale, R.: The intertidal fauna of the Mersey Estuary. J. Maritime Biol. Assoc., Plymouth 23: 83-98 (1938).
- (3) Blegvad, H.: Investigations of the bottom fauna at outfalls of drains in the Sound. Rep. Danish Biol. Station 37: 1-20 (1932).
- (4) Filice, F. P.: An ecological survey of the Castro Creek area in San Pablo Bay. Wasmann J. Biol. 12: 1-24 (1954).
- (5) Los Angeles Regional Water Pollution Control Board No. 4: Los Angeles-Long Beach Harbor pollution survey. Los Angeles, The Board, 1952, 43 pp.
- (6) Reish, D. J., and Winter, H. A.: The ecology of Alamitos Bay, California, with emphasis upon pollution. California Fish and Game 40: 105-121 (1954).
- (7) Patrick, R.: A proposed biological measure of stream conditions, based on a survey of the Conestoga Basin. Lancaster County, Pennsylvania. Proc. Philadelphia Acad. Sc. 101: 227-341 (1949).
- (8) Hartman, O.: Quantitative survey of the benthos of San Pedro Basin, California. Allan Hancock Pacific Expeditions 19: 1-185 (1955).
- (9) Berkeley, E., and Berkeley, C.: Canadian Pacific fauna, *Polychaeta sedentaria*, No. 9b (2). Toronto, Fishery Research Board, 1952, pp. 1-139.
- (10) Hartman, O.: The marine annelids of San Francisco Bay and its environs, California. Allan Hancock Foundation Occasional Paper No. 15. Los Angeles, University of Southern California, Allan Hancock Foundation, 1954, 20 pp.
- (11) Berkeley, E., and Berkeley, C.: Canadian Pacific fauna, *Polychaeta errantia*, No. 9a (1). Toronto, Fishery Research Board, 1948, pp. 1-100.
- (12) Okuda, S.: Spioniform polychaetes from Japan. J. Fac. Sc. Hokkaido Imp. Univ. (Ser. 6) 5: 217-251 (1937).
- (13) Hartman, O.: Descriptions of new species and new generic records of polychaetous annelids from California of the families Glyceridae, Eunicidae, Stauronereidae, and Opheliidae. University of California Pub. Zool. 43: 93-112 (1938).
- (14) Hartman, O., and Reish, D. J.: The marine annelids of Oregon. Oregon State College Monograph Series, Studies in Zoology, No. 6. Corvallis, Oregon State College, 1950, 64 pp.

# How the Public Health Worker Feels About His Job

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THE public health worker's feelings about his job—his satisfactions and his dissatisfactions—was one of several areas of study included in the Yale Public Health Personnel Research Project, which sought to provide information that would be useful in improving public health administration. For this portion of the project, 1,098 professional and semiprofessional workers in selected public health agencies were interviewed. The agencies included the State health departments of Connecticut, Maryland, and Michigan, several county health departments and visiting nurse associations in these States, and one large county health department in New York. The sampling process and the interview techniques are described in the May 1955 *Public Health Reports*, pages 447-452. Since the development of a method proved to be equally as important

in this project as the collection of data, the findings demonstrate both the use of the method and certain attitudes characteristic of public health workers.

The satisfactions and dissatisfactions expressed by the workers fell quite naturally into four categories.

First, there was a like or dislike for public health in general. Remarks such as "I enjoy public health work," "I get a feeling of accomplishment in public health," and "I find public health work satisfying," or "I dislike public health work," "I cannot use my previous training and experience in public health," and "I cannot see any results in public health" were classified in this group. The term "public health in general" defies exact definition. Obviously, the worker's concept of public health has been conditioned by his own experiences; had his experiences been other than what they were, his concept of public health might have been different.

The second major category concerned salary and job security. It included such individual items as salary, provisions for retirement and pensions, tenure, and opportunities for advancement.

Recognition and appreciation in the agency, a "feeling of belonging," and relationships with co-workers composed a third group, which was called status in the agency and interpersonal relations.

The fourth category, labeled conditions of work, related to such factors as working hours, working facilities, amount of clerical work, place of work (in the office or in the field), phys-

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ical demands of the job, and freedom and responsibility to make decisions.

In considering the data presented in the following pages, it should be remembered that the agencies studied were selected as better-than-average organizations and consequently may not be representative of all agencies. Rather detailed data are presented in the tables, but many of the findings are not discussed because the information necessary to proper evaluation is not available to the authors, inasmuch as the Yale study did not encompass case studies of individual health agencies; because many of the subgroups of workers are too small for valid generalizations; and because the need for keeping the report within a reasonable length precludes extensive discussion.

### **Satisfactions and Dissatisfactions**

Sixty percent of the public health workers interviewed in this study said that they were happy with their work, even though some of them mentioned dissatisfaction with specific aspects of their jobs (table 1). Thirty-eight percent liked the conditions under which they worked; 32 percent found pleasure in their relations with their associates or in the recognition they received in the agency; and 22 percent expressed satisfaction with salary or job security.

Dissatisfaction was encountered most frequently in relation to the conditions of work, about which 33 percent of the workers were unhappy. Twenty-five percent were not satisfied with salary or job security, and 15 percent complained about their lack of status or their unsatisfactory relations with associates. Fourteen percent of the workers were dissatisfied with public health work generally.

The frequency of expressions of satisfaction varied somewhat with position in the administrative hierarchy and the governmental level of the agency. Notably the percentage of State health department staff workers (includes both junior and senior staffs) who expressed satisfaction with public health work was lower than the percentage of any other group. Associated with this was the fact that a lower percentage of State staff personnel than of any other group spoke of enjoying their status in the agency or

their relations with associates. Furthermore, satisfaction with working conditions was expressed less frequently by State workers, regardless of administrative level. Only with respect to salary and job security did a greater proportion of State than of local personnel express satisfaction.

With one exception, there were no important differences related to governmental or administrative level in the expression of dissatisfactions. The exception concerned salary and job security, with which relatively few high-echelon personnel (includes all personnel of supervisor and higher rank) in State health departments were dissatisfied.

### **Public Health in General**

Varying percentages of the workers expressed no feelings, one way or the other, about public health work in general. However, between 12 and 15 percent were unhappy with public health, and about two-thirds of the high-echelon personnel in State and local jurisdictions and of staff personnel in local agencies and 43 percent of the staff personnel in State health departments expressed satisfaction with public health (table 2).

The low proportion of workers among State staff personnel expressing satisfaction can be attributed primarily to the fact that a relatively small proportion of laboratory staff personnel in State health departments appear to be happy in public health, and such personnel constitute a large segment of the State staff workers. The feelings of the staff laboratory workers in State health departments are in striking contrast to those of the staff laboratory workers in the local health departments. Medical and statistics staff personnel in State health departments also showed relatively little enthusiasm for public health.

### **Salary and Job Security**

About half of the workers were noncommittal about salary and job security, and the remainder were almost evenly divided in expressing satisfaction and dissatisfaction with these aspects of their jobs (table 3).

Dissatisfaction centered upon salary. Staff

**Table 1. Satisfaction and dissatisfactions of State and local public health workers<sup>1</sup>**

Administrative and governmental level	Number of workers	Percent expressing satisfaction with—				Percent expressing dissatisfaction with—			
		Public health work in general	Salary and job security	Status and inter-personal relations	Work-ing conditions	Public health work in general	Salary and job security	Status and inter-personal relations	Work-ing conditions
<i>Staff</i>									
Local-----	482	67	14	35	42	15	29	14	31
State-----	302	43	33	24	29	14	29	19	32
<i>High-echelon</i>									
Local-----	153	66	20	37	46	12	22	18	40
State-----	161	63	30	35	32	12	10	12	34
Total-----	1, 098	60	22	32	38	14	25	15	33

<sup>1</sup> Includes workers in visiting nurse associations.

**Table 2. Feelings of health department personnel<sup>1</sup> about public health work**

Governmental level and service	Staff			High-echelon		
	Number	Percent dissatisfied	Percent satisfied	Number	Percent dissatisfied	Percent satisfied
Local.....	482	15	67	153	12	66
Medical.....	5	20	60	36	17	58
Nursing.....	349	16	79	78	8	69
Sanitation.....	84	16	57	15	20	67
Laboratory.....	19	16	95	8	12	50
Health education.....	6	0	50	3	0	67
Statistics.....	6	17	33	0		
Administration.....	0			4	0	100
Other.....	13	8	54	9	22	67
State.....	302	14	43	161	12	63
Medical.....	15	13	27	31	19	61
Nursing.....	14	0	100	27	15	56
Sanitation.....	47	13	81	27	11	82
Laboratory.....	158	15	37	23	17	52
Health education.....	7	0	0	5	0	20
Statistics.....	21	5	29	10	10	90
Administration.....	3	33	67	11	0	45
Other.....	37	27	24	27	4	70

<sup>1</sup> Includes personnel in visiting nurse associations.

workers in State health departments also complained about the lack of opportunities for advancement. The expression of dissatisfaction with retirement plans and pensions and tenure was minimal.

Except for high-echelon personnel in State health departments, only 7 percent of whom considered their salary inadequate, roughly 20 percent of the workers were dissatisfied with their salaries. In the local health departments, a relatively high proportion of sanitation per-

sonnel at both administrative levels complained about salary. In the State health departments, staff nurses were most concerned.

Nineteen percent of the staff workers in State health departments, as compared to 3 percent of other public health workers, were unhappy about the lack of opportunities for advancement. Sanitation and laboratory staff personnel in State health departments were largely responsible for this high proportion.

On the positive side, almost equal percentages

expressed satisfaction with salary, retirement plans and pensions, and tenure. A relatively small number praised the opportunities for advancement.

About 10 percent of the workers felt that their salaries were good: The proportion was somewhat higher for State than for local personnel and for workers at the higher administrative levels than for staff workers. The dif-

ference between State and local personnel was particularly noticeable in the sanitation service, where more State workers at both administrative levels than their counterparts in local health departments appeared to be satisfied with their salaries. Furthermore, among high-echelon personnel in the State health departments, satisfaction with salary was more common among sanitation personnel than among

**Table 3. Feelings of health department personnel<sup>1</sup> about salary and job security**

Position and service	Number	Percent dissatisfied with—					Percent satisfied with—				
		Any aspect of salary and job security <sup>2</sup>	Salary	Retirement and pensions	Tenure	Opportunities for advancement	Any aspect of salary and job security <sup>2</sup>	Salary	Retirement and pensions	Tenure	Opportunities for advancement
<i>Staff</i>											
Local .....	482	29	23	1	1	3	14	6	4	6	4
Medical .....	5	40	40	0	0	0	0	0	0	0	0
Nursing .....	349	22	15	1	0	3	15	6	3	7	5
Sanitation .....	84	52	50	2	2	5	8	4	4	4	0
Laboratory .....	19	20	10	0	0	10	10	5	0	0	5
Health education .....	6	33	17	0	17	0	17	17	0	0	0
Statistics .....	6	17	17	0	0	0	33	0	17	17	0
Administration .....	0										
Other .....	13	38	38	0	0	0	38	23	31	23	8
State .....	302	29	20	4	1	19	33	13	19	15	4
Medical .....	15	0	0	0	0	0	0	0	0	0	0
Nursing .....	14	57	57	0	0	0	21	0	0	7	0
Sanitation .....	47	43	34	8	2	34	55	21	43	45	4
Laboratory .....	158	30	15	2	1	22	32	10	17	12	5
Health education .....	7	0	0	0	0	0	14	0	0	14	0
Statistics .....	21	19	14	0	0	10	43	19	43	5	10
Administration .....	3	67	33	0	0	33	67	33	33	67	33
Other .....	37	27	27	14	0	14	24	19	0	0	0
<i>High-echelon</i>											
Local .....	153	22	20	1	3	5	20	11	12	8	5
Medical .....	36	17	14	0	6	6	22	19	14	8	0
Nursing .....	78	17	14	0	0	2	17	9	13	9	6
Sanitation .....	15	47	47	0	0	13	33	0	20	20	7
Laboratory .....	8	50	50	12	0	12	25	25	12	0	0
Health education .....	3	0	0	0	0	0	33	33	0	0	0
Statistics .....	0										
Administration .....	4	50	50	0	25	25	0	0	0	0	0
Other .....	9	22	22	0	11	0	11	0	0	0	11
State .....	161	10	7	1	2	2	30	16	19	14	5
Medical .....	31	6	3	0	3	0	23	6	13	3	3
Nursing .....	27	7	4	4	4	0	7	0	0	7	0
Sanitation .....	27	7	7	0	0	0	52	37	52	48	11
Laboratory .....	23	22	22	0	0	4	44	22	35	17	9
Health education .....	5	0	0	0	0	0	0	0	0	0	0
Statistics .....	10	0	0	0	0	0	50	10	30	10	10
Administration .....	11	27	0	0	0	27	18	9	9	0	0
Other .....	27	11	7	0	4	0	30	22	4	4	4

<sup>1</sup> Includes personnel in visiting nurse associations.

<sup>2</sup> Includes an occasional individual not included in the subcategories listed.

personnel of the medical and nursing services.

As with salaries, appreciation of retirement and pension plans and of tenure was expressed more often by State than by local and by high-echelon than by staff personnel. Here again, a larger proportion of State than of local sanitation personnel and, to a lesser extent, a larger proportion of State than of local laboratory personnel, appeared satisfied with these bene-

fits. The proportions among State sanitation and laboratory personnel were also greater than the proportions among State medical and nursing personnel.

### Agency Status and Interpersonal Relations

Fifteen percent of the workers were dissatisfied with their status in the agency and their

**Table 4. Feelings of health department personnel<sup>1</sup> about status in the agency and interpersonal relations**

Position and service	Number	Percent dissatisfied with—				Percent satisfied with—			
		Any aspect of inter- personal relations and status <sup>2</sup>	Inter- personal relations	Recog- nition and appre- ciation	Feeling of be- longing	Any aspect of inter- personal relations and status <sup>2</sup>	Inter- personal relations	Recog- nition and appre- ciation	Feeling of be- longing
<i>Staff</i>									
Local.....	482	14	3	9	3	35	31	9	16
Medical.....	5	0	0	0	0	0	0	0	0
Nursing.....	349	14	2	10	2	40	35	10	16
Sanitation.....	84	7	4	1	0	24	21	2	16
Laboratory.....	19	16	0	10	10	21	21	5	10
Health education.....	6	33	17	33	33	0	0	0	0
Statistics.....	6	17	17	0	0	33	0	0	33
Administration.....	0								
Other.....	13	31	15	23	15	31	31	23	23
State.....	302	19	0	16	10	24	24	10	10
Medical.....	15	0	0	0	0	7	7	0	0
Nursing.....	14	0	0	0	0	7	7	0	7
Sanitation.....	47	21	0	19	6	62	62	30	43
Laboratory.....	158	19	0	16	10	17	17	5	2
Health education.....	7	29	14	29	14	14	14	0	0
Statistics.....	21	0	0	0	0	38	33	19	19
Administration.....	3	0	0	0	0	67	67	67	67
Other.....	37	40	0	35	27	8	8	3	3
<i>High-echelon</i>									
Local.....	153	18	6	11	3	37	33	15	12
Medical.....	36	14	14	6	3	30	28	14	6
Nursing.....	78	17	1	13	2	40	38	17	14
Sanitation.....	15	27	7	13	0	40	27	13	13
Laboratory.....	8	25	0	12	12	38	38	25	25
Health education.....	3	0	0	0	0	0	0	0	0
Statistics.....	0								
Administration.....	4	25	0	25	0	75	50	0	25
Other.....	9	33	22	11	0	22	22	11	11
State.....	161	12	2	7	4	35	31	16	14
Medical.....	31	6	3	3	0	29	23	13	13
Nursing.....	27	4	0	0	0	30	30	4	7
Sanitation.....	27	7	0	4	4	82	74	48	37
Laboratory.....	23	22	4	9	13	39	26	13	9
Health education.....	5	20	0	20	0	20	20	0	0
Statistics.....	10	10	0	0	0	20	20	20	20
Administration.....	11	0	0	0	0	9	0	9	0
Other.....	27	26	4	26	7	15	15	4	7

<sup>1</sup> Includes personnel in visiting nurse associations.

<sup>2</sup> Includes an occasional individual not included in the subcategories listed.

relationships on the job; 32 percent were satisfied; and the remainder had no strong feelings about these aspects of their job (table 4). Although there were no significant differences on the basis of governmental or administrative level with respect to all dissatisfactions in this category, it should be noted that fewer State health department staff personnel than any other comparable group expressed satisfaction with these aspects of their jobs. The only important difference among the services was the high proportion of State sanitation personnel who expressed satisfaction.

The most frequent complaint related to lack of recognition and appreciation in the agency. Eleven percent of the workers made this complaint. It was expressed most often by staff personnel in State health departments, and among these, by sanitation, laboratory, and "other" workers. By contrast, high-echelon personnel in State health departments made this complaint relatively infrequently.

Eleven percent of the workers also expressed satisfaction with the appreciation and recognition given them in their agencies. The proportion was somewhat greater among high-echelon than among staff personnel. It is interesting to note that a relatively high percentage of sanitation personnel in State health departments expressed satisfaction with this feature of their work. The frequency with which sanitation personnel react, either favorably or unfavorably, to the recognition given them might be an indication of the importance which they attach to status.

Five percent of the workers indicated that they missed what can be called a feeling of belonging in their organization. Once again, staff personnel in State health departments were the group that seemed to be the most dissatisfied. Among the services, laboratory personnel were the most prone to make this complaint, although only 10 percent did so.

Fourteen percent of the workers commented that they felt very much a part of the agency. Sanitation personnel in State health departments stood out in this respect.

Dissatisfaction with interpersonal relations was relatively rare; only 2 percent of all personnel voiced this complaint.

On the other hand, nearly 30 percent of the

workers felt that their good relationships with co-workers were important enough to mention. Among staff personnel, nurses in local health departments and members of the sanitation service in State health departments seemed particularly appreciative of good working relationships with their colleagues. This was also true of high-echelon personnel in State health departments.

### Conditions of Work

One-third of the workers were dissatisfied with one or another of the conditions of their work (table 5). State and local workers, staff and high-echelon personnel, were about equally dissatisfied. Dissatisfaction was greatest among staff laboratory personnel in local health departments and staff sanitation and health education personnel in State health departments.

On the positive side, more than one-third of the workers expressed satisfaction with some aspect of their working conditions. More local than State personnel expressed such satisfaction. The proportion of satisfied sanitation personnel ran somewhat higher than that for the other services. As pointed out previously, a high proportion of State sanitation personnel also expressed dissatisfaction with some aspect of working conditions. It would appear from these findings that sanitation personnel are more sensitive than others to the conditions under which they work.

The greatest number of complaints about working conditions concerned excessive clerical work and inadequate work facilities.

Sixteen percent of the workers were unhappy about what they considered to be excessive clerical work. Such tasks appeared to be most oppressive to high-echelon personnel in local health departments and least oppressive to staff workers in State health departments. Sanitation personnel in State health departments and high-echelon nurses in local health departments were particularly unhappy about their burden of clerical work.

Fourteen percent of the workers complained about inadequate work facilities. State and local workers, regardless of administrative level, had similar proportions. Less than 3 percent

of the workers were inclined to praise the facilities. Laboratory and statistics personnel felt the lack of facilities most keenly.

Six percent of the workers complained of lack of freedom and responsibility in their jobs. Such complaints tended to be more frequent among State staff than local staff personnel. They were voiced most frequently by staff med-

ical personnel in State and local health departments and by staff sanitation personnel in State health departments.

On the other hand, the opportunities for freedom and responsibility which their jobs afforded them were satisfying to 23 percent of the workers. As might be expected from other findings of this study, such feelings were least

Table 5. Feelings of health department personnel<sup>1</sup> about conditions of work

Position and service	Number	Percent dissatisfied with—							Percent satisfied with—					
		Any aspect of work conditions	Lack of freedom and responsibility	Length of working day	Arduous nature of work	Work facilities	Indoor work	Excessive clerical work	Any aspect of work conditions	Opportunities for freedom and responsibility	Length of working day	Easy nature of work	Work facilities	Outdoor work
<i>Staff</i>														
Local	482	31	3	1	2	13	3	18	42	26	21	4	4	11
Medical	5	40	20	0	0	20	0	20	0	0	0	0	0	0
Nursing	349	32	2	1	1	13	4	20	42	27	24	3	6	11
Sanitation	84	14	6	0	0	1	2	11	49	27	11	5	1	16
Laboratory	19	63	10	5	16	37	0	16	42	21	26	5	0	5
Health education	6	33	0	0	0	17	0	33	17	17	0	0	0	0
Statistics	6	50	0	0	0	33	0	33	17	0	17	0	0	0
Administration	0													
Other	13	54	0	0	0	38	0	23	46	38	31	15	0	0
State	302	32	9	4	2	17	1	10	29	11	15	6	1	5
Medical	15	20	13	0	0	0	0	27	7	7	0	0	0	0
Nursing	14	14	0	0	7	0	0	14	14	14	0	0	0	0
Sanitation	47	57	17	26	4	8	0	32	51	26	15	8	4	23
Laboratory	158	30	8	1	2	25	0	2	25	7	13	8	0	0
Health education	7	57	0	0	0	14	14	57	14	0	14	0	0	0
Statistics	21	14	0	0	0	14	5	0	43	14	19	0	0	0
Administration	3	33	0	0	0	0	0	33	33	33	33	33	0	0
Other	37	22	14	0	0	8	0	0	24	5	24	0	0	14
<i>High-echelon</i>														
Local	153	40	8	1	0	12	8	22	46	31	23	4	1	3
Medical	36	39	11	0	0	14	8	19	47	25	25	11	0	3
Nursing	78	46	10	0	0	10	10	28	49	36	26	1	2	0
Sanitation	15	20	0	7	0	7	7	7	47	27	20	0	0	13
Laboratory	8	25	0	0	0	12	0	12	50	50	0	0	0	0
Health education	3	0	0	0	0	0	0	0	33	0	33	33	0	0
Statistics	0													
Administration	4	50	0	0	0	25	0	25	25	25	25	0	0	0
Other	9	56	11	0	0	33	0	22	33	22	11	0	0	11
State	161	34	4	6	2	12	7	17	32	27	7	1	3	6
Medical	31	39	10	3	0	6	19	16	36	23	13	0	3	0
Nursing	27	15	0	0	4	4	0	15	22	22	0	0	0	4
Sanitation	27	48	0	33	4	7	7	37	63	63	11	4	11	15
Laboratory	23	39	9	0	4	30	9	4	26	13	13	0	4	0
Health education	5	0	0	0	0	0	0	0	40	0	0	0	0	0
Statistics	10	50	0	0	0	40	10	10	30	20	0	0	0	10
Administration	11	27	9	0	0	9	0	9	9	9	0	0	0	0
Other	27	30	0	0	0	11	0	22	30	18	4	0	0	11

<sup>1</sup> Includes personnel in visiting nurse associations.



**Table 6. Percentage of workers desiring to leave public health and of all other workers dissatisfied with specified aspects of their jobs**

Cause of dissatisfaction	Workers desiring to leave public health (49)	All other workers (1,049)
Inadequate salary-----	41	21
Lack of freedom and responsibility-----	31	5
Lack of recognition and appreciation-----	29	12
Lack of a feeling of belonging-----	20	5
Lack of opportunities for advancement-----	18	8
Too much clerical work-----	16	18
Inadequate work facilities-----	10	15
Public health in general-----	45	14

frequent among staff personnel in State health departments. Relatively few of the staff laboratory personnel in State health departments or of the staff physicians in either State or local jurisdictions found their jobs satisfying in this respect. By contrast, a relatively large number of high-echelon nursing personnel in local agencies and of high-echelon sanitation personnel in State agencies found satisfaction in the freedom and responsibility for decisions and action which their jobs offered.

Four percent complained because so much of the work was indoor, office work. This objection was met with more frequently among high-echelon than staff personnel, and most frequently among high-echelon medical personnel in State health departments. On the other hand, 8 percent enjoyed their jobs because of the outdoor work involved. For all practical purposes, however, this feeling was restricted to staff and high-echelon sanitation personnel in State and local agencies and to staff nurses in local agencies. None of the workers in this study expressed a dislike of outdoor work or satisfaction with indoor work.

Three percent of the workers complained that the working day was too long. Complaints were more frequent among State than local personnel, principally because of the dissatisfaction of members of the sanitation service with this aspect of their jobs. Eighteen percent of the workers expressed satisfaction with the length of the working day. Such positive

feelings were least frequent among high-echelon personnel in State health departments.

Less than 2 percent of the workers felt that the work was too arduous. Four percent considered it important to mention that the work was not arduous.

### Workers Desiring to Leave Public Health

Forty-nine of the one thousand ninety-eight workers interviewed in this study stated that they would like to leave public health for another career. In table 6 are shown the percentages of these workers and of all other workers who were dissatisfied with various aspects of their jobs. From these data, it can be seen that expressions of dissatisfaction were considerably more frequent among the workers who wished to leave public health. A much larger percentage of these workers than of all other workers were dissatisfied with low salaries, lack of responsibility and freedom of action, the absence of opportunities for advancement, and the lack of recognition and a sense of belonging in the agency, as well as with public health in general.

The relative importance of the various causes of dissatisfaction is shown in another frame of reference in table 7, which records the percentage of all dissatisfied workers in each category who desire to leave public health. These

**Table 7. Percentage of dissatisfied workers who desire to leave public health**

Cause of dissatisfaction	Total number dissatisfied	Workers desiring to leave public health	
		Number dissatisfied	Percent of total dissatisfied
Inadequate salary-----	240	20	8.3
Lack of freedom and responsibility-----	68	15	22.0
Lack of recognition and appreciation-----	140	14	10.0
Lack of a feeling of belonging-----	62	10	16.1
Lack of opportunities for advancement-----	93	9	9.7
Too much clerical work-----	197	8	4.1
Inadequate work facilities-----	162	5	3.1
Public health in general-----	169	22	13.0

data indicate that the feeling of a lack of freedom and responsibility is the most potent factor contributing to the desire to leave public health. Almost 1 in 4 of those who feel this lack in their work want to give up public health work altogether. Lack of a feeling of belonging in the agency would seem to be another potent factor, for 1 in 6 workers who mentioned this lack wish to leave public health. These two areas of dissatisfaction are ones in which remedies may be found through improved administration, without additional funds.

### Summary and Conclusions

Fourteen percent of the workers were unhappy about public health work in general. These feelings were not associated with governmental or administrative level or service. Although the general dislike for public health of some of the workers might be related to the character of current public health organization and practice, it would seem safe to say that often it is, rather, a reflection of personal incompatibility to this type of work, and that both public health and the individual concerned would be left in the long run by the withdrawal of this group from public health.

Specific causes of dissatisfaction mentioned frequently were: inadequate salary, excessive clerical work, inadequate work facilities, lack of recognition and appreciation in the agency, lack of opportunity for advancement, lack of responsibility and freedom of action, and the absence of a feeling of belonging in the agency. They were voiced, in the order given, by 20, 16, 14, 11, 8, 6, and 5 percent of the workers.

Although many of these complaints were shared by all, regardless of governmental level, administrative position, or service, these factors played an important role in a number of instances. Thus, dissatisfaction with salary appeared to be most common among sanitation personnel in local health departments and nurses in supervisory and administrative positions in State health departments. Staff sanitation and laboratory personnel in State health departments tended to be disturbed about the lack of opportunities for advancement and the meager recognition and appreciation which they received. Furthermore, State staff personnel

generally, and the laboratory workers particularly, were most apt to feel that they missed a feeling of belonging in the agency.

Dissatisfaction because of lack of responsibility and freedom of action occurred most frequently among staff medical personnel in both State and local health departments and among staff sanitation personnel in State health departments. The burden of clerical work seemed to be felt most heavily by sanitation workers and staff physicians in State health departments and by high-echelon nurses in local agencies. Laboratory and statistics personnel were most prone to complain of inadequate working facilities.

Sixty percent of the workers expressed satisfaction with their work in public health. The greatest single source of satisfaction for public health workers was not in their jobs but in their associates. Twenty-nine percent of the workers chose to emphasize the satisfying nature of relationships with their co-workers. The next most frequent source of satisfaction was the personal gratification which came with a feeling of responsibility and freedom to make decisions and take appropriate action. About one-fourth of the workers said that this characteristic of the work was particularly satisfying to them. Among the next five most frequent sources of satisfaction, each reported by at least 10 percent of the workers, were two which might be classified as meeting emotional needs. These were a feeling of belonging in the organization and recognition and appreciation of the worker's contributions. The other three were concerned with length of the working day, salary, and job security.

Although such economic considerations as salary and security are important determinants of the public health worker's feelings about his job, matters of a more personal nature, such as relationships with co-workers, a feeling of belonging, recognition and appreciation, and the sense of importance which results from having responsibility and exercising authority, are at least equally important. It should be possible, even without additional funds, to improve these aspects of the public health worker's job through proper administrative practices.

Few will care to deny that, as a general rule, burdening professional personnel with clerical

work is evidence of improper administration. Perhaps it is not equally apparent, but it is true nonetheless, that proper administrative practices can be effective in fostering good interpersonal relations on the job. They can also provide for recognition and appreciation of the worker's efforts and accomplishments. A feeling of belonging will grow in any organization that is administered in such fashion that a sense of mission is inculcated not only in the

men at the top but in every member of the team. Moreover, the proper delegation of authority and responsibility is essential to day-to-day efficiency and, perhaps even more important, to the morale and health of the organization.

Too often, the health of the organization is overlooked in our preoccupation with the health of the community. This practice will inevitably detract from the success of public health programs.

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# A Child Health Program

in the

## Mountains of Peru

By CRAIG BURNS, M.D.

THE MOUNTAINS of Peru rise quickly and sharply a few miles inland from the sea. The train from Lima must climb to 3 miles above sea level before it reaches a pass through which it can proceed to the Andean plateau and thence to the town of La Oroya, 137 miles to the east. It is the people of this area, which is in the region of Peru called the *sierra*, with whom this paper is concerned.

The Andean plateau of central Peru is above the tree line. Its elevation varies from 10,000 to 16,000 feet, with most of the people living at altitudes between 11,000 and 15,000 feet. A few eucalyptus trees, brought in after the conquest by Pizarro, grow in some of the sheltered valleys at the lower levels. The climate is temperate, with as much sunshine as in Reno, Nev. In summer, December through March, rainfall is moderately heavy, night temperatures rarely fall below freezing, and the daytime temperature is about the same indoors and out. During winter, June to September, almost no rain falls, the nights are cold and frosty, and the days are warm and sunny. Because the air is thin, it is difficult to start a fire, and water evaporates at an astounding rate.

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*Dr. Burns is chief physician of Chulec General Hospital, operated by the Cerro de Paseo Corp. at La Oroya, Peru.*

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The climate of the plateau is invigorating, and there are few insects, no reptiles, and no dangerous beasts. But it is no paradise. Syphilis and tuberculosis are major afflictions. Typhoid fever, typhus fever, rabies, and hydatid disease are endemic. From data obtained in La Oroya, it is estimated 1 of every 4 children dies before the age of 13 years.

It should be emphasized, however, that health conditions throughout Peru are improving at an ever-increasing tempo. The Peruvian Ministry of Public Health, which has responsibility for the health of all the people, is conducting campaigns against prevalent diseases. Municipalities are participating in the national health program in matters concerning sanitation of public buildings, urban hygiene, protection of food and water supplies, and sewage systems. The Servicio Cooperativo Interamericano de Salud Pública, an official Peruvian agency financed jointly by the United States and the Peruvian Governments, is engaged in almost all phases of preventive and curative medicine. Attention given to the problems of the hard-to-reach regions of the *sierra* is quite naturally less than that given to the more accessible coastal areas. As in other mountainous areas of the world, living conditions in the *sierra* do not attract volunteers in health work.

Particularly important in Peru is the advance in industrial hygiene. Since 1947, when a law made mandatory an industrial hygiene

program for miners and other industrial workers, the Department of Industrial Hygiene, with assistance from the Servicio, has conducted medical and engineering studies in many of Peru's industries. Already evident are improvements in control of dust, in sanitation, and in protective devices for workers.

Another significant factor in health is the effort, by both the government and the large industries, to improve housing. New houses under construction by one large mining company for its workers have two rooms, a stove, running water, and a flush toilet. Many families in the *sierra*, however, still live in one-room houses without inside water or sanitary facilities. In the mining towns, these houses have a stove or fireplace. In the outlying areas, the natives construct a low stone house, called a *chosa*, with a roof of straw or grass through which the smoke from cooking and heating fires seeps out. The floor of the *chosa* is dirt, and the bed is a bank of earth, a few feet above the level of the floor.

In the plateau area, the Peruvian Government operates two general hospitals for workers (but not for their families) and one tuberculosis hospital, and it has set up agencies for public health work. In addition, the Cerro de Pasco Corp., which has mining, smelting, and ranching operations throughout the *sierra*, maintains 10 hospitals and 8 dispensaries, employing 22 physicians. It provides medical care for its workers and their families, some 60,000 people in all.

My assignment in La Oroya began in late 1953. There had been little public health work in this area, and the number of children needing medical services was startling. Chulec General Hospital, a 130-bed, well-equipped hospital of the Cerro de Pasco Corp., cares for most of the town's 25,000 population and also receives patients needing specialized treatment from the other nine smaller company hospitals. The hospital employs 8 physicians and 3 interns, and it operates a separate outpatient clinic staffed by 2 Peruvian physicians. Because the patient load of these facilities was overwhelming, I found it necessary to abandon specific objectives of general practice and to concentrate on the sources of human ills—un-

hygienic practices, improper diet, and endemic diseases.

The fundamental need was for health education. One of the difficulties, however, was the lack of means of communication. About 95 percent of the population is Spanish speaking; the remainder converse only in Quechua, the old Inca language. Almost half of the population cannot read or write. An incident in March 1954 demonstrated that even colorful and attractive charts containing printed words could not be depended upon to deliver the desired message. We placed three such charts, on nutrition and diet, in the hospital waiting room, which was crowded with patients. Were they well received? Was everything clear to the patients? A quick survey disclosed that not one patient in the room understood the charts.

In attempting health education, one may begin with the adults and hope that the new information will be handed down to the young people. I believe, however, that major emphasis should be given to the health of the children. This is the story of the development of a child health program in La Oroya. It recounts experiences from December 1953 through November 1954, and it shows the progress of ideas, the work accomplished, and the changes in attitudes of all persons concerned.

### The Pediatric Department

*December 1, 1953: Pediatric department organized at Chulec General Hospital; children's bed capacity doubled, from 4 to 8! An average of 200 children seen daily in outpatient clinic; no time for immunizations, adequate records, or followup care. Few parents will accept routine immunizations for their children or allow them to be hospitalized.*

Establishment of the pediatric department was the beginning of the concentrated effort to improve the health of the children in La Oroya. In past years, few children had been patients of the hospital, although there was much illness and many deaths among them. According to information obtained from the parents of children brought to the hospital or the clinic during the period of this report, 27 percent of their children had died before they reached the age

of 13 years (which is the age when many of the children begin to shift for themselves), but only 6 percent of these deaths had occurred in a hospital (table 1). It seemed that the people of La Oroya did not have much faith in medical care or that they did not understand that it was not necessary for so many children to die. We soon learned, however, that it was not that they were adverse to hospitals and modern medicine, but that they didn't know what to expect from them. This is illustrated by the following incident:

*January 29, 1954: Parents brought in 3-month-old baby with six toes on left foot. Since local superstition about having six toes creates fear and anxiety, they wanted an operation right away—they would wait while we took off the unsightly toe so that they could take the baby home. Finally, they were persuaded to leave the baby for 4 days. Brother of baby also had six toes and had been successfully operated upon earlier.*

By February, the bed capacity of the pediatric ward had been increased to 14, not counting bassinets for infants. By May there were 20 beds for children, 16 bassinets, and 2 incubators. Of necessity, the ward is run quite differently from such wards in the United States. For

lack of space, beds are close together; there is no possibility of isolation. Most of the children eat their meals at a table in the center of the room, where the older children assist the younger ones. All the children are helpful and cheerful. A few newcomers cry for the first 24 hours, but rarely do the children fight among themselves. Many are reluctant to leave the hospital.

Visiting days at the hospital. Wednesdays and Sundays, are a festival. In troop parents and relatives in colorful costumes, the women carrying babies in *mantas* on their backs and all carrying baskets of fruits and jars of jellies. They sit on the floor about the beds, orderly and quiet, but they have many questions to ask. At first, at least half of the visiting parents wanted to take their children home with them, but now we are rarely bothered with these requests.

#### Causes of Illness and Death

The hospital data presented in tables 2 and 3 give some idea of the causes of death and illness among the children in La Oroya. According to these data, pneumonia, diarrhea, and tuberculosis rank high as causes of both illness and death, and syphilis is a major cause of illness. Burns, often resulting from the use of kerosene

**Table 1. Births and deaths of children among families interviewed in Chulec General Hospital and outpatient clinic, December 1953–November 1954**

Month of interview	Number of families interviewed	Number of children born	Number of children living	Number of children dead <sup>1</sup>	Percent of children dead	Number of deaths in hospital	Percent of deaths in hospital
December 1953	91	419	314	105	25	7	7
January 1954	77	338	242	96	28	5	5
February	99	401	288	113	28	13	11
March	93	377	270	107	28	5	5
April	93	417	315	102	24	9	9
May	82	350	246	104	28	7	7
June	101	391	292	99	25	3	3
July	90	383	281	102	26	7	7
August	101	428	318	110	25	8	7
September	92	396	278	118	29	4	3
October	93	401	278	123	30	3	2
November	88	386	280	106	27	5	5
Total	1,100	4,687	3,402	1,285	27	75	6

<sup>1</sup> Under 13 years of age.



"... the women carrying babies in mantas on their backs ...."

or gasoline to start fires in this area, also are a frequent cause for admission to the hospital.

Routine chest X-rays of adults show scar tissue of healed tubercles in more than 25 percent of those examined. That the disease remains a major problem is shown by the number of patients reporting for treatment as well as by the results of tuberculin tests and X-ray surveys. In one grade school of 800 students, 34 percent had positive reactions to the Mantoux test, and 3.36 percent were found to have active pulmonary tuberculosis.

Response to treatment for tuberculosis is remarkable. Good food, a bed to sleep on, and rest produce amazing results—the antituberculosis drugs are merely a dessert. Almost every patient responds rapidly to treatment. Active pulmonary tuberculosis has been cured even with ambulatory outpatient treatment.

Syphilis is seen in many forms. Several babies with arms and legs as hard as bone have been brought into the hospital. Others have syphilitic deterioration of the nose, the lips, or the anus. X-rays of older crippled children

reveal old healed syphilitic involvement of the joints. Blindness and other eye conditions resulting from this disease are not uncommon.

Hydatid disease was diagnosed in 1.4 percent of the 437 children admitted to the hospital. In this region of Peru, there are some 200,000 sheep, one of the natural hosts of the *Echinococcus granulosa*, and a great number of dogs, one of the carriers between animals and man. We found the disease as common among town children as among those living on the sheep ranches. Usually, the cysts are in the lungs, but we have found 1 in the axilla, 2 in the liver, 2 in the abdominal cavity, and 1 in the neck. The Casoni skin test is always positive in the presence of these infestations. Not one child has died from surgical removal of the cyst or cysts.

Each month there are a few patients with typhoid fever in the hospital, although there is never an epidemic. The Cerro de Pasco Corp. filters and chlorinates its water supplies, but there is no chemical or sanitary protection for the people living outside the larger towns. The rural women wash clothes in the same streams that carry sewage, and during a few months of the year, there are many flies.

#### Native Customs and Health

*June 28, 1954: Conference today with 50 union leaders representing the workers in the mines and smelters of the Cerro de Pasco Corp. They believed that climate, lack of money to spend on imported foods, and insufficient medical services were the three main causes of infant and child mortality. Demonstrations and discussion seemed to convince them that these were not the real causes.*

The appeal to these 50 slightly antagonistic fathers with union responsibilities began with the presentation of two charts. One compared the low death rates of infants and children in the United States with the very high rates in the La Oroya area. The second showed the estimated average number of days a year a child in the United States is ill and the comparable figure for their children. Especially emphasized was the negative influence of illness on the growth of children. When asked to give what

**Table 2. Major causes for admission of children to the Chulec General Hospital, December 1953–November 1954**

Cause for admission <sup>1</sup>	Number admitted	Percent of total <sup>2</sup>
Pneumonia.....	70	16.0
Diarrhea.....	65	15.0
Syphilis.....	36	8.2
Tuberculosis.....	22	5.0
Burns.....	22	5.0
Kidney.....	17	3.9
Typhoid fever.....	15	3.4
Cardiac.....	8	1.9
Other, including parasites and surgery.....	182	41.6

<sup>1</sup> Only one diagnosis (reason for admission) considered here.

<sup>2</sup> A total of 437 children admitted during period.

they thought were the reasons for the differences shown in the charts, the union leaders expressed the opinions previously mentioned.

If these were the true reasons, we stated, then the children of all ages should be affected about the same. But this was not so. A chart (fig. 1) showed them that a large percentage of the deaths among children occurred before the age of 2 years. Here was a problem—what causes so many children to die during the first 2 years of life? We believe that the lack of iron-containing foods in the diet of young children—a majority of the children are anemic before they reach the age of 2 years (fig. 2)—and the use of *fajas* are contributing significantly to this

situation. We proceeded to try to convince the union leaders of the importance of these factors.

The men laughed when shown a picture of themselves at night—a man and a woman lying on a bed with a child between them breast-feeding throughout the night. We explained that allowing the child to breast-feed all night (a practice that may continue until the child is 2 to 4 years old) spoils his appetite for health-giving foods in the daytime. A child needs iron, and there is practically no iron in milk. To illustrate the last point, we used the following demonstration:

Two 2-liter beakers were placed on the table, along with a 1½-liter bottle of basic fuchsin solution (which is the color of blood), and a quart bottle of milk. The first beaker was filled one-third full of fuchsin solution, to represent the amount of blood in a newborn baby. The second beaker was filled almost full with the fuchsin solution, to represent the amount of blood in a 1-year-old child. During the first year of life, the baby's body has to make the quantity of blood shown by the difference in the amount of liquid in the two beakers. If the baby gets only milk (containing no iron), the blood looks like this—and the quart of milk was emptied into the first beaker, bringing the level of the liquid up to the level in the second beaker. What a difference in color! The blood fortified with milk was a sickly pink shade.

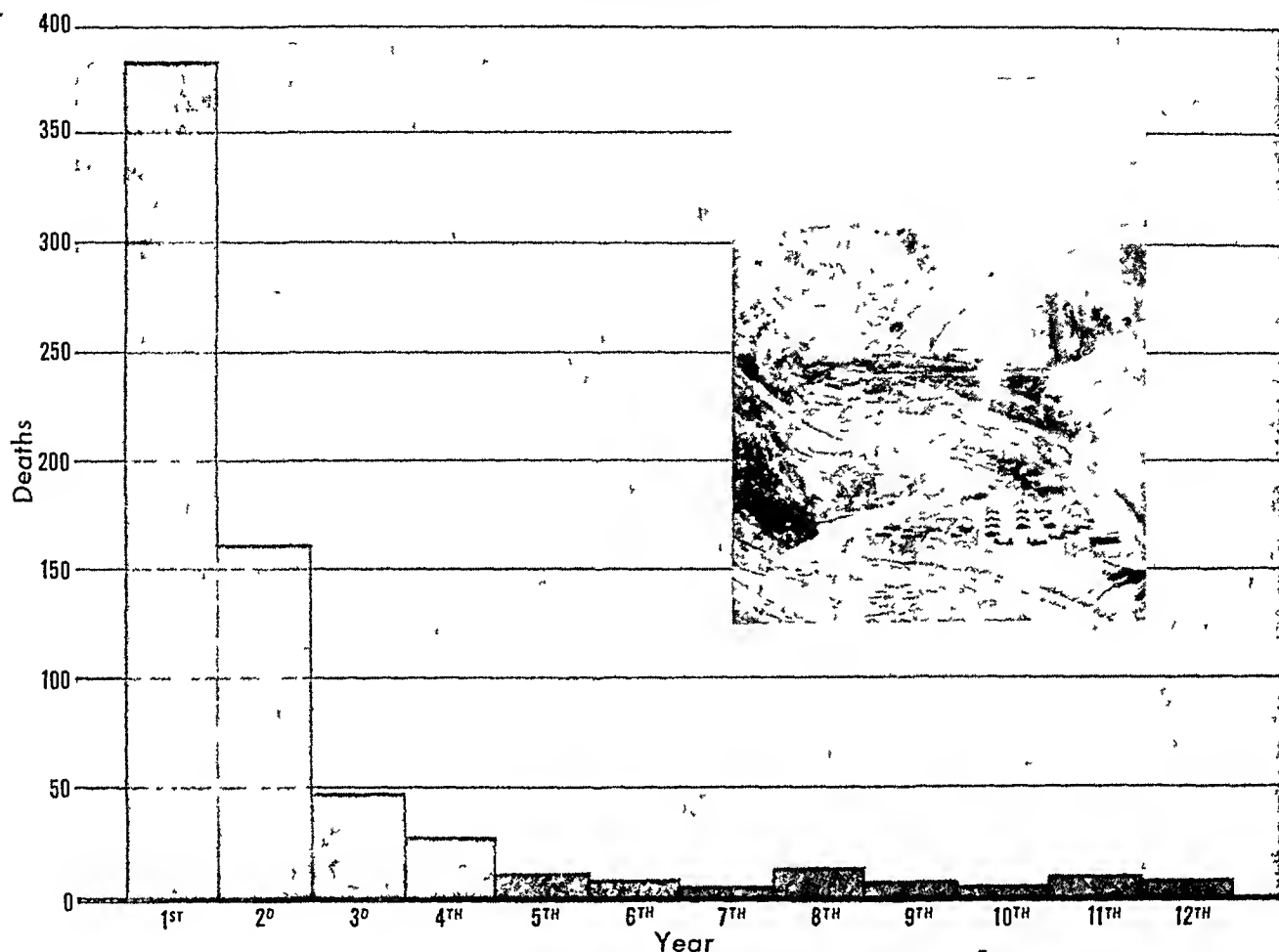
By now the men began to appear interested. Appetite for iron-containing foods, as well as other nutritional foods, we continued, is also

**Table 3. Causes of death among children under 13 years of age in Chulec General Hospital, December 1953–November 1954**

Age	Cause of death					
	Pneumonia	Diarrhea	Tuberculous meningitis	Tuberculosis	Other causes	Unknown
0–6 months.....	3	0	1	1	2	0
6–12 months.....	1	4	1	0	0	0
1 year.....	3	3	0	1	2	1
2 years.....	1	0	1	0	0	0
3 years.....	1	0	1	1	0	0
4 years.....	0	0	0	0	1	0
6 years.....	0	0	0	0	0	0
11 years.....	0	0	1	0	1	0
Total.....	9	7	5	3	6	1



Figure 1. Age at death for 675 children of the Peruvian sierra, according to information obtained from their parents.



dulled as a result of the practice of adding sugar to all liquid given a child—1 to 3 teaspoonfuls to every cup of water or milk or coffee. Sugar does not contain iron, and we demonstrated this point as follows:

Sugar, like wood, burns and gives energy, with only ashes left—no minerals, no iron to form blood. Had they ever obtained iron by burning wood? A stick of wood was produced and burned—the men smiled when the ashes were passed around for their inspection. Did they know that sugar would burn too? A volunteer was called for, a man smoking a cigarette. A pile of sugar was placed on a plate on the table. Cigarette ashes were mixed with the sugar, the ashes representing the chemicals in the body. Then the sugar was ignited with a match, and the men saw that it burned like wood. They could find no iron in the ashes.

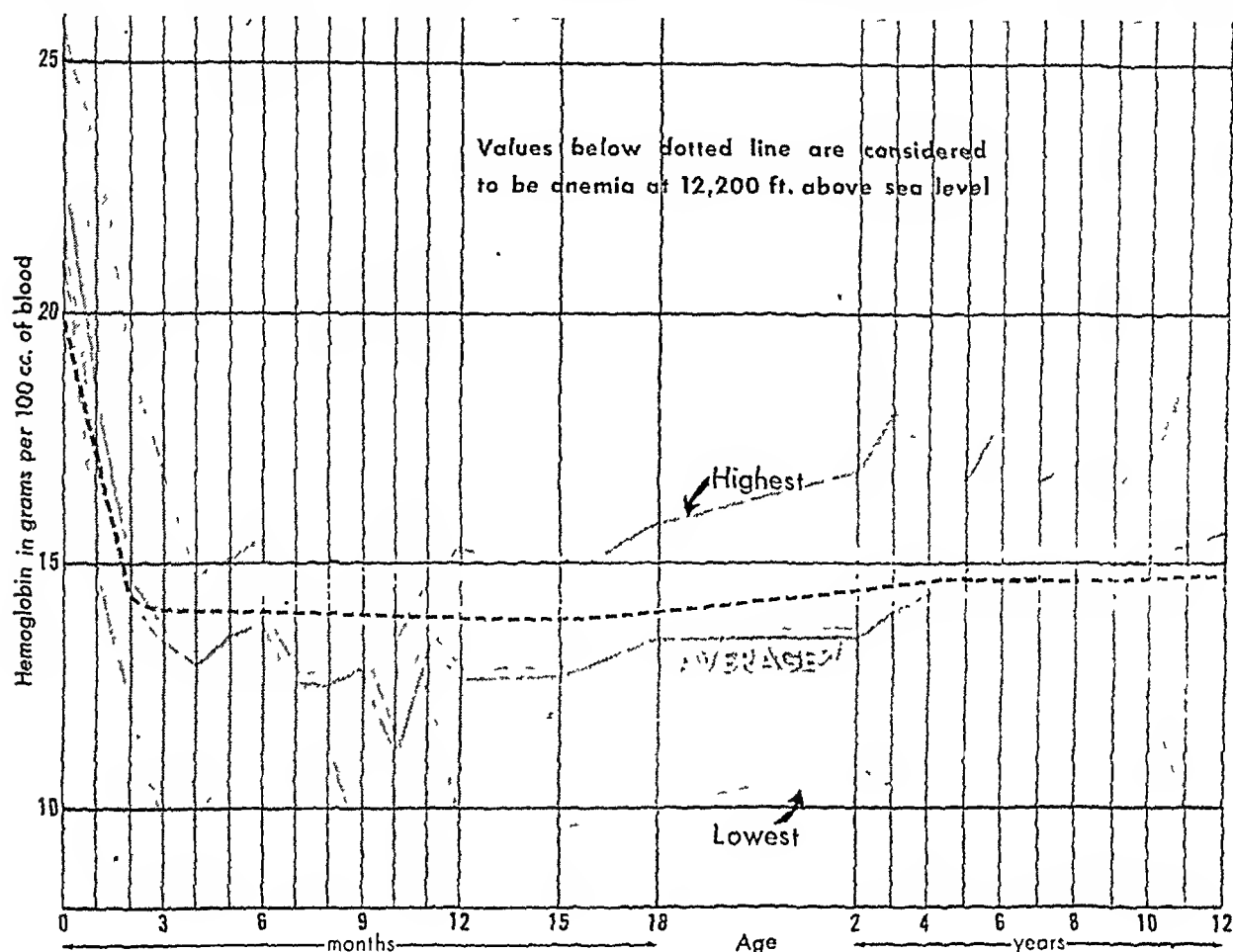
After these demonstrations, we emphasized

that there were plenty of iron-containing foods available locally, but that they were not being used. We urged the men to send their wives to the clinic so that we could instruct them in proper diet for children.

Next, the subject of *fajas* was discussed. *Faja* is the name of the woven cotton or wool band which is wrapped around a baby from the time he is born until he is 2 or 3 years old. Three *fajas* are usually used. One is placed next to the skin around the chest. The second is wrapped around the body and arms at the level of the elbows to keep the baby from using his arms to climb out of the *manta* in which he is carried on his mother's back. The third *faja* is placed at the level of the knees to keep the baby's legs quiet.

When asked about the *fajas*, every woman gives the same answer: If the baby does not begin life with the *fajas*, *se recalca*. But get-

Figure 2. Hemoglobin values for 365 children tested in La Oroya, December 1953–November 1954.



ting to the meaning of *se recalca* is another matter. It means that the ribs will not stay where they should. It means that the baby will have stomach pains. It means that the baby will have "much cough" when he grows up and that he must then be held upside down and shaken so that the bones will go to the proper places. But the *fajas*, we attempted to explain, prevent full expansion of the lungs and hinder blood circulation and normal body movements in the rapidly growing baby, and thus they may contribute to many of the ills and deformities of the population. We have seen deformed ribs and concave thoraxes produced by this constriction.

#### Child Health Clinics

**May 31, 1954:** *The first child health clinic was held in La Oroya today, from 3 to 4 p. m.*

*Number of patients was overwhelming. Managed to see 14 mothers with 18 children. Gave 17 injections of DTP vaccine; instructed the mothers on diet and cleanliness; and distributed fifteen 1-cc. dropper bottles of ferrous sulfate solution.*

The need for a children's clinic in La Oroya had been recognized early, and plans for the operation were under way by April. The clinic was envisaged as a means not only of providing medical care but of increasing the efforts to prevent illness. Hence, immunizations against such diseases as whooping cough, diphtheria, smallpox, and typhoid fever, as well as education in matters of diet, cleanliness, and the like, have been as important a part of the clinic program as the treatment of ill children.

At the conference with the union leaders previously mentioned, the final subject of discussion

was immunizations. A show of hands revealed that 13 of the men present were unable to sleep well the night before because of coughing children. We guaranteed them that if they saw to it that their workers brought their children to the clinic for whooping cough immunizations, there would be no epidemic of that disease the next year.

Originally scheduled for 2 hours a week, the clinic was soon being held 10 hours a week. Always, there were more patients than could be seen in the allotted time. By August, although most of the mothers still brought their children because of cough, fever, or diarrhea, a few were coming only to receive the immunizations.

### School Health Program

*August 26, 1954: Our first visit to a school—76 students aged 4 through 12 years. Set up table and chairs in the playground and administered smallpox and DTP vaccine to each child. Placed inkmark on child's right hand to show that he had received the immunizations—his badge of bravery.*

This visit represented another major step in the child health program, for it was the beginning of our school health activities. Two more visits were made to this school to complete the DTP immunizations, and during these visits many of the children's mothers appeared in the schoolyard and asked us to vaccinate their children who were too young to attend school. One mother even brought a small dog, figuring that what was good enough for her baby was good enough for her puppy.

On September 8, 1954, we held our first conference on health with the teachers of one of the larger schools in the town (800 students). The teachers unanimously agreed that nutrition was the major health problem, and we discussed a powdered-milk program as a first step in meeting it. (The powdered-milk program finally got under way in mid-1955.) We also presented a filmstrip lecture on how disease is transmitted, and the following week we gave the same lecture to each class as an introduction to a typhoid immunization program. Subsequently, the typhoid immunization pro-

gram was carried out, with full cooperation from both students and teachers. Interest ran particularly high because one schoolboy, the son of one of the teachers, became ill with typhoid fever 2 days before the program was begun.

In November, BCG immunizations were begun. The vaccine is made in Lima and furnished free by the Peruvian Government, which also supplies free the typhoid, DTP (from UNICEF), and smallpox vaccines. Every baby born in the hospital and every schoolchild who reacts negatively to the tuberculin skin test now receive the BCG vaccine.

### Recent Developments

A review of the child health clinics after the first 6 months of operation indicated that we were not making the best possible use of our time. The following changes have been made in recent months:

1. A Peruvian physician specializing in pediatrics sees all children brought into the outpatient clinic in La Oroya. He has a staff of three auxiliary nurses trained in pediatrics (Peruvian women who have received training at Chulec General Hospital), who interview each mother and give her instructions as to diet, cleanliness, and when to return to the clinic.

2. Every child brought to the outpatient clinic is given DTP and typhoid immunizations.

3. A child health nurse has been employed to supervise the child health program in the clinics, the schools, and the outlying areas.

4. A visual education program has been started in each of the schools to teach the importance of cleanliness and immunizations.

5. A well-baby clinic has been established.

6. Every mother delivering a baby at Chulec General Hospital is given a course of instruction in infant care while she is in the hospital.

### Summary and Conclusions

In line with the increasing efforts to improve health conditions throughout Peru, an intensive child health program was begun in La Oroya in December 1953. The first action was

the establishment of a pediatric department at the Chulec General Hospital. Within the next year, child health clinics were started and a school health program was initiated. These latter activities, with their emphasis on immunizations and health education, were directed toward the prevention of illness, rather than its treatment.

The tempo of progress in the betterment of health in Peru has been accelerating rapidly during the past 5 years. This can be attributed largely to the following factors:

1. Efforts of the Peruvian Government and assistance from the bilateral programs of the United States and from international health agencies.

2. Change for the better in the attitude of foreign companies toward their workers.

3. The antibiotics. (It would be almost im-

possible to attempt a program against syphilis without penicillin, for example.)

4. The provision of better housing by both the Government and the foreign corporations.

My work in La Oroya for the past 2 years leads me to the conclusion that the following items are among those most needed for further advancement:

1. Better equipped schools and more years of instruction—to raise the level of general education, as well as health education, and to make it possible for more Peruvians to meet the requirements for advanced education so that the supply of trained local people can be increased.

2. A 300-bed tuberculosis hospital to serve the people of the central Andean plateau.

3. Improvement of the public roads.

4. Incorporation of a utilizable form of iron in canned milk to help combat anemia.

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## Vending Stands for the Blind

A report from the Office of Vocational Rehabilitation issued at the end of October 1955 showed that 1,721 blind vending stand operators (602 on Federal property) were employed in 1954 as against 1,659 during 1953, the previous high. Operators and their employees (310 blind and 746 sighted assistants) earned \$5.3 million in the year ending June 30, 1955, an increase of \$500,000 over the preceding year. The net earnings of the operators totaled approximately \$4 million and those of the assistants, \$1.3 million.

An act initially passed in 1936 provided for the establishment of vending stands in federally owned or leased buildings. Amendments in 1954 authorized the establishment of such stands on other property, such as national parks and grounds of Federal buildings. They require each Federal agency in control of property to issue regulations designed to assure preference for blind persons in the operation of vending stands on that property.

The great majority of the blind persons employed in the vending stand program have been trained through the State-Federal vocational rehabilitation program. Only about 8 percent of the estimated 320,000 blind persons in the United States are employed although experience has indicated that about 25 percent of those disabled by blindness can be trained for gainful employment.

# Classifying the Tuberculous for Isolation in California Mental Institutions

By WALDO R. OECHSLI, M.D., EDWARD KUPKA, M.D., M.P.H., and CHESLEY BUSH, M.D.

**T**UBERCULOSIS is a well-known scourge among the mentally ill. When a patient with active tuberculosis is admitted to a mental hospital, because of the nature of his mental illness, he may cough or expectorate only infrequently or not at all. He may be afebrile. He is not X-rayed and not diagnosed and thus becomes a focus of infection in the large confined population. Overcrowding in the past has sometimes been so severe that a patient often had to climb over another patient's bed to reach his own.

Such circumstances are ideal for transmittal of the disease; in time, the secondary cases infect others, and the vicious circle continues. This situation is due to a number of factors: lack of knowledge of who are the actively tuberculous individuals being admitted to a greatly overcrowded hospital population; the absence of an easy, practical method of discovering tuberculosis; incomplete segregation; absence of treatment for unrecognized cases; and the tendency of tuberculosis to become reactivated (1). The key underlying factor in the problem is the communicability of the disease.

## Procedures for Control

Periodic X-ray surveys of the entire hospital population, including personnel, segregation of

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the tuberculous thus discovered, and instituting an X-ray program at admission have become the basis for the solution of this, one of the most serious remaining problems in the tuberculosis control field. In many States there is increasing evidence that this approach is successful in reducing the number of new cases discovered by annual X-ray surveys and in decreasing the intramural tuberculosis death rate.

A death rate of over 1,000 per 100,000 population among hospitalized mentally ill was not uncommon 20 years ago as compared with a rate of 56.6 per 100,000 among the general population in the United States in 1934. As more diagnosis, segregation, and treatment are effected, the rate in mental institutions is dropping. In 1948, Anderson (2) reported that the tuberculosis death rate for 682,251 patients in the mental institutions of this country was 535 per 100,000. Weber (3), in Toronto, reported a drop in the intramural death rate from 414 in 1938 to 182 in 1952. Katz and his co-workers (4, 5) in New York reported a decrease in death rate from 623.6 per 100,000 in 1935 to 252.4 in 1951, and they attributed this decrease to environmental factors, chiefly early diagnosis and segregation.

In the California hospitals for the mentally ill, the death rate rose substantially until 1946, to a peak of 800 per 100,000 resident population (table 1, fig. 1). Since 1946, when a continuing X-ray survey and segregation program started, the death rate among the mentally ill has dropped 65 percent—to 283 per 100,000. Among the mentally deficient, the death rate, which had generally been lower than among the mentally ill, has dropped to 29 per 100,000.

## Tuberculosis Classification for Isolation

**Type A.** Active and probably active; communicable.

**Type B.** Probably inactive; greater than minimal extent; potentially communicable; more likely to undergo reactivation than type C.

**Type C.** Strictly minimal in extent; inactive; presumably not communicable; reactivation considered unlikely.

**Type D.** Calcified primary lesions, parenchymal or hilar or both. Considered essentially negative.

**Type E.** Formerly suspected tuberculosis, now negative on film; probable nontuberculous pathology; calcified or thickened pleura only.

This favorable result is due largely to the aggressive case-finding and isolation program in effect.

Satisfactory as this decline may appear, much remains to be accomplished. Continuing persistent effort will be necessary. Instituting an X-ray program at admission and surveying a mental hospital once are not sufficient. Wherever repeated annual X-ray surveys have been carried out, it has been found that a certain number of new cases develop within the institution each year even among the apparently un-

exposed. In California, the first survey (6) revealed a prevalence of a tremendous number of unsuspected cases of tuberculosis. Later an annual survey incidence rate of about  $1\frac{1}{2}$  new active cases per 1,000 patients X-rayed was found (7). The true incidence rate is unquestionably higher than the survey incidence rate.

## Deficiencies in Control

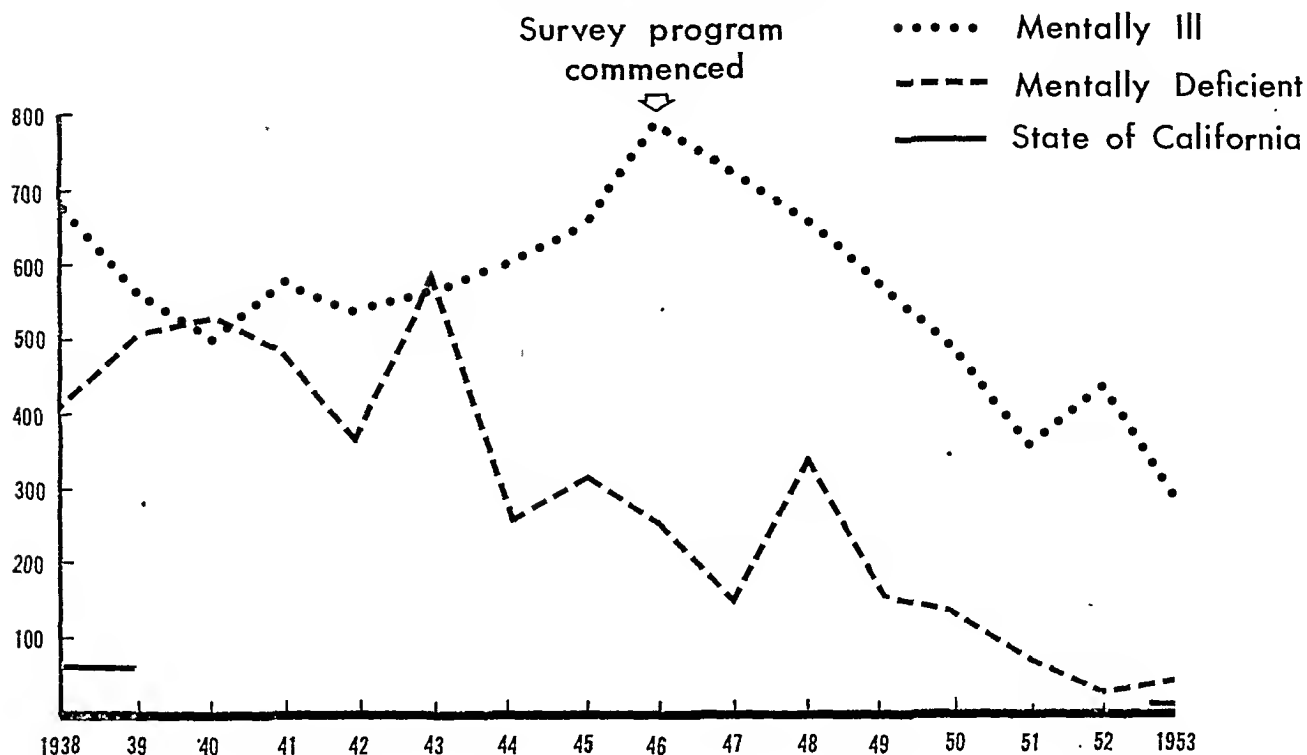
Granting the theoretical possibility of endogenous reinfection as a factor, in our opinion these new cases arise chiefly because of deficiencies in the control system. These deficiencies may be many, depending on the stress laid on the tuberculosis control program and the zeal with which control measures are applied. They include failure to take admission films on all patients; failure to include patients on parole; and the very ill, infirm, or disturbed patients in annual X-ray surveys; delay in discovering reactivation of tuberculosis through failure to X-ray periodically those with supposedly inactive disease; missing the diagnosis of active tuberculosis which is occasionally atypical in its manifestation; and too great dependence on demonstration of tubercle bacilli as a criterion for segregation.

Probably most important among these deficiencies is the occurrence of reactivation of

**Table 1. Tuberculosis death rates per 100,000 in California mental institutions and in the State, 1938-53**

Year	Mentally ill			Mentally deficient			State death rate
	Average daily population	Number of tuberculosis deaths	Death rate	Average daily population	Number of tuberculosis deaths	Death rate	
1938-----	21,281	144	677	3,723	15	403	60.5
1939-----	22,200	125	563	3,840	20	521	57.6
1940-----	22,853	115	502	3,950	21	532	56.3
1941-----	23,055	133	576	4,279	21	491	51.9
1942-----	23,511	128	545	4,547	17	363	50.6
1943-----	23,961	136	568	4,738	28	591	45.7
1944-----	24,573	148	607	4,782	13	272	43.7
1945-----	25,385	169	667	4,951	16	323	43.1
1946-----	26,101	209	800	5,078	13	256	41.6
1947-----	26,796	199	743	5,326	8	152	34.4
1948-----	28,420	190	668	5,741	19	331	31.6
1949-----	29,675	172	580	6,205	10	161	26.3
1950-----	30,861	149	482	6,467	9	139	21.7
1951-----	33,288	122	366	6,541	4	70	19.5
1952-----	32,808	147	448	6,600	1	15	15.5
1953-----	34,588	98	283	6,828	2	29	11.4

**Tuberculosis death rate per 100,000 for mentally ill and mentally deficient in California institutions and for the State, 1938-53**



disease in the unsegregated, supposedly inactive tuberculous patients (8, 9). Despite the estimate that the tuberculosis in these patients had been considered as inactive, routine X-rays on 14" x 17" films made at the time of annual X-ray surveys showed that unsuspected reactivation had taken place in a certain proportion of such patients. Reactivation was judged by one or more of the following criteria: (a) cavitation where none had existed; (b) infiltration in a new area; or (c) definite increase in density of certain areas of infiltration. Since laboratory aids were often unavailable, it was necessary to make careful comparison of chest X-rays of comparable technical quality before this conclusion was felt to be justified, recognizing that the securing of comparable films on mentally ill persons requires care and patience.

Laboratory confirmation of activity is, of course, more dependable and a more definitive proof of pathological activity. However, such proof was not always available, and conditions had to be dealt with as they were.

It has been said that dealing with the mentally ill, in diagnosis at least, has some of the characteristics of pediatric or veterinary medi-

cine. Often, the patient will not be able to give reliable information regarding his symptoms or cooperate in producing sputum. Add to this the shortage of personnel, especially laboratory technicians, and it becomes necessary to depend heavily upon X-ray findings, even when only a single chest film is available. However, when one has a series of chest X-rays of comparable technical quality, activity of the disease process can often be inferred by changes inter-

**Table 2. Reactivation or progression of known tuberculosis among unsegregated mentally ill patients as observed by annual X-ray surveys in California mental institutions, 1947-54**

Survey year	Number of patients X-rayed (14" x 17" films)	Tuberculosis reactivation or progression	
		Number	Percent
1947-48-----	261	32	12.3
1948-49-----	221	19	8.6
1949-50-----	370	24	6.9
1950-51-----	410	35	8.5
1951-52-----	516	26	5.0
1952-53-----	608	27	4.4
1953-54-----	597	33	5.5

puted as evidence of progression of disease, as noted above.

As part of the second of the California surveys in 1947-48, 261 unsegregated patients with presumably inactive tuberculosis were X-rayed (table 2). Of these, 32 (12.3 percent) presented X-ray evidence of progression of disease. In subsequent surveys, the percentage of those showing progression dropped to less than half of this ratio. Nevertheless, a ratio of 1 in 20 unsegregated, apparently safe, tuberculosis patients suffering reactivation each year is surprisingly large, dangerous to nontuberculous patients and personnel, and calls for corrective action.

### Resolving the Problem

The most nearly complete solution of the problem would seem to be the segregation of all patients diagnosed as tuberculous, regardless of extent of disease or its activity status. This alternative is open to objections. It is too restrictive for the patients who have had arrestment of their disease for many years, and neither isolation space nor additional personnel are available. Other than a laissez-faire policy, the alternative was to appraise the criteria for segregation.

Two solutions presented themselves. Since the crucial factor in communicability of tuberculosis is the presence of tubercle bacilli, it appears logical to base a decision for segregation on the demonstrated presence of the organism in the sputum or in gastric or tracheal washings. Laboratory investigation certainly should be made regularly and frequently. However, it appeared unwise always to await bacteriological proof before segregating a patient with tuberculosis, since a given patient's findings might be negative today and positive tomorrow. Since examination by culture and guinea pigs takes weeks, the hazard of exposure exists for that period of time. Furthermore, laboratory technicians and other needed personnel were not available, and it often was not possible to carry out even a minimum laboratory investigation. Also, it was difficult, and at times impossible, to intubate some of the patients, and dependence on such clinical findings and symptoms as fever, loss of weight, and cough is no-

toriously unreliable. In some cases tuberculin testing ruled out tuberculosis; however, the small percentage of the mentally ill who are negative to tuberculin minimizes the value of this test.

For these reasons, the other possible solution was utilized—serial chest X-ray examinations. As a starting point we again examined the X-rays of every mental institution patient who had ever had a diagnosis of tuberculosis or suspected tuberculosis. Some patients had only one film, most patients had several, and quite a few of long residence had dozens of films each. The serial films were supplemented by any available sputum studies, skin tests, or clinical evidence. On the basis of this film reappraisal, an arbitrary decision was reached in each instance. If the patient was still considered tuberculous, a further decision on segregation had to be made.

Some type of classification was needed to designate those who should or need not be segregated. The requirements were to categorize patients not by extent or activity of disease alone but by actual or potential communicability. The classification of the National Tuberculosis Association was not suitable for this study for two reasons: "Arrested" under certain circumstances permits a positive sputum by the more delicate tests, and "inactive" includes cases which still have a potential of reactivation high enough to be of great importance in mental hospital populations. Hence, a new classification was created to designate three groups—currently communicable, potentially communicable, and probably not communicable (types A, B, C).

*Type A.* The finding of tubercle bacilli by any method automatically places a patient in this category regardless of the X-ray appearance. In the absence of positive sputum findings, the chest X-rays must present the findings characteristic of recent, active tuberculosis: soft, exudative, caseous pneumonic or soft, miliary infiltration, or cavitation. Reactivation or extension of infiltration or the appearance of cavity in a recent film also calls for a type A classification. All these patients are presumed to have communicable disease and are strictly segregated. They also are as vigorously treated as their cooperation permits.

*Type B.* Chest X-rays of patients in this



group give an impression of relative or definite inactivity. Cavity must not be present or suspected. Bullous blebs, of course, must be differentiated. The sputum must be negative by any type of investigation; if it has been positive in the past, it must have been negative for at least 1 year. The infiltration is more or less discrete and fibrotic and may be calcific. There may be sharply circumscribed, dense areas usually associated with encapsulated, caseous lesions. If the disease has been active in the fairly recent past or if of longer standing it is more extensive than minimal, these patients are presumed to present a potential communicability hazard. Segregation, however, need not be quite as strict as for type A patients. They may leave the ward, if attended and supervised, for treatments, motion pictures, beauty parlor, or barber shop. Nevertheless, they should be X-rayed every 3 months and, if possible, sputum examinations or gastric lavage performed periodically every 3 months. Their diet should be adequate. They receive whatever psychiatric treatment is indicated, but they need no treatment for tuberculosis.

*Type C.* This group includes only those in whom reactivation of tuberculosis is considered quite unlikely. The infiltration must be stable, very discrete and fibrotic or fibrocalcific and of small extent, with no evidence of activity for several years. A sharply circumscribed tuberculoma less than 2 cm. in diameter may be present, if not of recent origin. The laboratory findings, of course, must be negative. These patients are not segregated, but care is taken that they are not lost to observation and they are X-rayed every 6 months. Their psychotherapeutic needs are cared for in the same way as the hospital population generally. If they are to be allowed to work, medical permission is required.

*Type D.* Calcified primary lesions, which are often hard to differentiate from fibrocalcific minimal reinfection tuberculosis, are placed in this category. Although some of these patients had in the past been included in the tuberculosis register in some hospitals, they are considered here as essentially negative and removed from the register. During the annual X-ray surveys, they are filmed along with the rest of the presumably negative patient population.

*Type E.* Various miscellaneous patients who sometime in the past were put on the tuberculosis register, but who in all probability were not tuberculous, were also reviewed and placed in this category. They included:

1. Those in whom tuberculosis had been tentatively diagnosed, or in whom infiltration of the lung fields had been observed, but in whom current chest films show completely clear lung fields.

2. Those with infiltration of the lungs once tentatively believed tuberculous. By location or progress, the infiltration seems more characteristic of some nontuberculous condition, particularly suppuration of the lung or bronchiectasis, or coccidioidomycosis.

3. Those with infiltration of the lungs which do not seem typical of tuberculosis, though this cause has not been absolutely ruled out. Great caution should be used in evaluating this group.

4. Those with thickening or calcification of the pleura of undetermined origin, in whom no parenchymal lesions are demonstrable.

Those in categories E-1 and E-4 require no further attention other than inclusion in annual X-ray surveys. Those in categories E-2 and E-3 require continuing clinical and laboratory study until a diagnosis is reached.

### Using the Classification Scheme

In the course of this review, we studied over 3,000 sets of chest X-ray films in 11 California State mental institutions in collaboration with the staff physicians in the hospitals. Each case was reviewed; the chest X-rays were carefully studied; and clinical data and available laboratory data were weighed. Decision as to classification rested largely on the serial X-ray films, however, because of the sparseness of clinical and laboratory data.

In 2,915 (85 percent of the 3,443 cases studied) the original diagnosis of tuberculosis seemed valid (table 3). Of the 2,915, 32 percent, or 923, were classified as type A. These constituted the most important group of patients needing strict segregation and active treatment. An additional 832, 28 percent, were classified as type B. This group of patients is considered almost as important as the type A patients. Be-

**Table 3. Classification and disposition of mentally ill and mentally deficient patients with known or suspected tuberculosis in California institutions, 1953**

Category	Type A		Type B		Type C		Type D		Type E		Total	
	Num- ber	Per- cent	Num- ber	Per- cent	Num- ber	Per- cent	Num- ber	Per- cent	Num- ber	Per- cent	Num- ber	Per- cent
Mentally ill.....	841	28	777	25	1,024	33	87	3	351	11	3,080	100
Male.....	572	30	446	23	638	33	54	3	220	11	1,930	62
Female.....	269	23	331	29	386	34	33	3	131	11	1,150	38
Mentally deficient.....	82	23	55	15	136	37	23	6	67	19	363	100
Male.....	41	21	29	15	78	40	11	6	34	18	193	53
Female.....	41	25	26	15	58	34	12	7	33	19	170	47
Grand total.....	923	27	832	24	1,160	34	110	3	418	12	3,443	100
Total diagnosed as tuber- culous.....	923	32	832	28	1,160	40					2,915	100
Total recommended for segregation.....	923	53	832	47							1,755	100
Total tuberculous but not segregated.....					1,160	100					1,160	100
Total removed from register.....							110	21	418	79	528	100

cause they have fewer symptoms, negative sputum, and an unchanging X-ray appearance, there is a strong tendency to consider these patients as inactive and, therefore, innocuous. The danger lies in the fact that reactivation (table 2), often unnoticed in the mentally ill, occurs distressingly often in this group of patients. If reactivation does take place, it is usually not discovered until the patient is X-rayed again. If he is not segregated during this period, many nontuberculous patients are exposed to infection. It is important, therefore, that the patients classified as type B should be segregated. Psychiatric treatment is given, of course, as needed.

The remaining 1,160, 40 percent, were classified as type C. This group was restricted, by definition, to those whose tuberculosis appeared very unlikely to reactivate because of its slight extent and fibrotic-appearing character over a long period of time. These patients were not segregated. However, since the estimate of the stability of disease could be in error, these patients should be X-rayed every 6 months instead of annually. Laboratory check is not needed unless the character of the disease changes.

Three percent, 110, of the 3,443 patients studied had findings which were judged as probably due to calcified primary lesions, hilar or parenchymal, or both (type D). Little or no skin

testing was done on these patients. The lesions may have been due to coccidioidomycosis or histoplasmosis. These patients were considered as essentially negative and were, therefore, removed from the register.

Twelve percent, 418, of the 3,443 were placed in one or another of the categories under type E. Some of these cases still presented diagnostic problems; others could be considered as non-tuberculous.

During and after this review of all tuberculosis patients in the mental institutions, the centralization of tuberculosis patients into a few institutions went on as rapidly as possible. A 500-bed tuberculosis hospital was completed at Patton State Hospital to care for tuberculosis patients from the southern part of California. At Napa State Hospital, a tuberculosis unit houses 240 patients. A 460-bed addition is being constructed there for tuberculosis patients from the central and northern part of the State. Until this addition is completed, tuberculous patients are being cared for at DeWitt State Hospital also. The tuberculous mentally deficient patients have been centralized at Sonoma State Hospital where a 120-bed tuberculosis hospital was built 3 years ago. The numbers of mental patients from which these tuberculous are drawn, in the above regional and type categories, were: mentally ill patients, southern California—13,000; mentally ill pa-

tients, central and northern California—22,000; mentally deficient patients, 7,400.

All patients classified as type A or type B were segregated and transferred to these tuberculosis centers. Type C or type D patients were not segregated nor moved from their wards or institutions. Patients classified as type E were studied further if a diagnostic problem existed. Otherwise, they remained in the general mental hospital population.

### Summary and Conclusions

Tuberculosis is still a serious problem of frequent occurrence among the mentally ill and mentally deficient. A program of X-ray of all admissions and periodic X-ray surveys plus segregation are the first requirements in control. However, segregation of patients with active tuberculosis does not entirely meet the problem. Tuberculosis often undergoes reactivation, and, in the mentally ill patient, this fact often goes unnoticed until revealed by X-ray. Segregation of all patients diagnosed as tuberculous, regardless of extent or status of disease, appears impracticable.

The classification of the National Tuberculosis Association is not suited to the needs of mental hospital populations. A new classification has been created, based on the appearance of X-rays plus available laboratory or clinical data. This classification designates three groups, currently communicable (type A), potentially communicable (type B), and unlikely to reactivate (type C). Two additional groups were designated: those with only calcified "primary" lesions (type D) and those once designated as suspects with probable nontuberculous pulmonary disease (type E).

In a review of the case histories and films of 3,443 mentally ill and mentally deficient patients with tuberculosis or suspected tuberculosis in California mental institutions, 27 percent were considered as communicable and were classed as type A; these patients were segregated and treated. Another 25 percent of the

patients were considered as potentially communicable and were classed as type B; these patients were segregated but not treated. Thirty-three percent were considered as noncommunicable and not likely to suffer reactivation and were classed as type C; these patients were neither segregated nor treated. A few patients (3 percent) were diagnosed as having only calcified "primary" lesions, and were considered, in effect, as nontuberculous and were classed as type D; these patients were removed from the tuberculosis register and were handled as other nontuberculous mentally ill patients. Eleven percent of the patients reviewed had X-ray evidence of pulmonary pathology which was considered as probably nontuberculous; these were classed as type E and only a few undiagnosed problem cases in this group are still being segregated.

### REFERENCES

- (1) Kupka, E.: Problem of tuberculosis in California State hospitals. *California & West. Med.* 61: 96-98, August 1944.
- (2) Anderson, R. J.: Tuberculosis problems in mental hospitals. *Ment. Hosp.* 3: 4-5, March 1952.
- (3) Weber, J. J.: Tuberculosis control in Ontario mental hospitals. In *Medical papers of the Canadian Tuberculosis Association*. Ottawa, The Association, 1953.
- (4) Katz, J., Kunofsky, S., and Locke, B. S.: Tuberculosis morbidity and mortality among mental patients as compared with the general population. *Am. Rev. Tuberc.* 70: 32-48, July 1954.
- (5) Katz, J., Plunkett, R. E., and Brill, H.: The control of tuberculosis among patients in mental institutions—A 10-year report. *Psychiatric Quart.* 28: 1-8, July 1954.
- (6) Oechsli, W. R.: Tuberculosis control program of nine California mental institutions. *Pub. Health Rep.* 64: 4-16, January 1949.
- (7) Oechsli, W. R.: Tuberculosis resurveys of patients in California mental institutions. *Pub. Health Rep.* 69: 560-568, June 1954.
- (8) Crawfis, E. H., Kupka, E., and Oechsli, W. R.: Tuberculosis control in California mental hospitals. *California Med.* 79: 390-393, November 1953.
- (9) Oechsli, W. R.: Significance of tuberculosis among the mentally ill. *Med. Times* 83: 24-28, January 1955.

# How One Health Department Helps the Handicapped

By MURRAY GRANT, M.D., D.P.H.

FOR several years, the Cattaraugus County Health Department has participated in the New York State medical rehabilitation program, which arranges for the diagnosis and treatment of physically handicapped children under the age of 21 and of persons of any age with poliomyelitis.

However, participation was not without its obstacles. Chief of these was the local lack of recognized specialists in rehabilitation. As a result, almost all patients eligible for rehabilitation service had to be transported from Cattaraugus County to Buffalo, approximately 70 miles away. Moreover, the expense was imposing an additional tax burden on the people of Cattaraugus County, a rural county of 80,000 with a median income below the median for the United States, where the tax burden was already increasing every year.

During 1953, a survey by the author found that a considerable proportion of the total expenditures for rehabilitation went for treatment of cerebral palsy and poliomyelitis cases and that most of these funds were expended for physical, occupational, and speech therapy. Most patients remained in Buffalo or at a treatment center near New York City for months. During their absence from home, particularly in the case of cerebral palsy patients, the initial

zeal with which parents accepted treatment for their children was often transformed into lack of interest and even fear of the burden to be reassumed when the children returned home.

The staff of the county health department felt that, if there were a sufficient number of patients in the county to warrant it, an outpatient clinic staffed by full-time, physical, occupational, and speech therapists and operated by the health department might offer certain advantages:

1. The health department could initiate a rehabilitation program for both children and adults. Many children are not seen under the State rehabilitation program, and therapy is not available to all adults.

2. Patients could be seen 2 or 3 times a week and could continue to live at home instead of being separated from their families for weeks and months.

3. Parents of handicapped children could accompany them to the treatment center, where the parents could not only see what was being done for their children but also could learn how to continue the treatment at home.

4. The initial interest with which parents seek and accept treatment for their cerebral palsied children could be capitalized upon, because the parents would be able to share in planning the treatment.

5. The family physician could participate more actively in the program. Because children had been sent to specialists in Buffalo, away from the private physician, there had been some antagonism to the State medical re-

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habilitation program on the part of local physicians.

6. The new program would result in considerably less expenditure of funds, and yet service could be given to many more persons.

### Organization

Specialists in rehabilitation felt that an outpatient clinic in the county would be worth trying. However, although the clinic team could be administratively responsible to the county commissioner of health, a qualified person would have to be responsible for medical supervision. Therefore, an orthopedist with special experience in cerebral palsy was recruited. He resides in Buffalo and visits the county four times a year to see patients, ascertain their progress, and recommend therapy.

The orthopedist remains at the clinic from 9 a. m. to noon. He examines the patients, evaluates their progress, and, if necessary, recommends continued treatment or surgery. He also sees new cases or cases in which there is a question of the value of rehabilitation clinic service—for example, a cerebral palsy patient with a low I. Q. For these children, he will usually recommend psychological examination, which is usually done at the county mental health clinic. For all patients coming directly to the clinic, the orthopedist dictates a progress report, which is sent to the family physician; if the patient is referred by a physician, the orthopedist telephones him to discuss the case and the findings and recommendations.

Investigation revealed that the number of known handicapped persons in the county warranted the establishment of a clinic staffed by full-time personnel, and the county health department included in its 1954 budget an item of approximately \$12,000 for a rehabilitation clinic. The county board of health approved the item, and the board of supervisors, the appropriating body, included it in the budget. A most influential factor in their decision was the statement that expenditures would be reduced and services increased.

Recruitment of qualified personnel was difficult but was accomplished in time for the clinic to commence limited operations in March 1954. Clinic headquarters were established in the

county health department in Olean, and an additional treatment center was set up in another area having a considerable population.

Transportation of patients to the treatment centers was expected to be a major difficulty. However, there has been surprisingly little difficulty and, on the 1 or 2 occasions when transportation has been an obstacle, arrangements have been made with volunteer workers to bring patients to the treatment center.

A nominal charge of \$1 is made each time a patient visits the clinic or treatment center because we believe that it helps give to the families the feeling that they, too, are contributing to the patient's rehabilitation. No extra charge is made when patients are seen by more than one therapist. The fee system is flexible, and the charge is waived when the patient or his family is unable to pay. Only once has a parent declined further treatment for a child because of the fee, and she brought the child back to the clinic when the fee was waived.

So far, most of the clinic patients are children, who have visited the treatment center twice a week for several months. The policy is not to accept children unless they are accompanied by a parent, primarily to insure parent participation in the treatment program—by watching how the child is treated and by being shown what can be done for him at home. Practice at home is strongly encouraged, and the importance of not assuming that treatment at the clinic is sufficient is stressed. Each therapy session usually lasts half an hour; if a patient receives all three types of therapy—physical, occupational, and speech—he remains at the clinic for approximately an hour and a half.

### Publicity

A program was arranged at a hospital staff meeting at which all three therapists described their services. To acquaint the public—particularly those who are possible sources of referral of patients, such as physicians, schools, and social agencies—with the clinic and what it is trying to do, the county medical society was kept informed of developments. Several newspaper articles were published, with pictures. Two local service clubs donated equipment, and pictures were taken of the presentation and

published in the local newspapers. The clinic was discussed at community meetings and, in the near future, a meeting will be held with all school authorities in the county to describe the clinic services. However, informing the public about the rehabilitation services is a slow process, which must continue indefinitely.

Convincing local physicians of the value of the rehabilitation clinic and persuading them to refer patients to it also must be a continuing educational process. Most physicians recognize that a patient with a speech defect can be helped, but the concept of occupational therapy or even of physical therapy is more difficult to appreciate. Physicians will be convinced of the clinic's value if they know that patients have been definitely benefited by the treatment received there. For example, after a patient with multiple sclerosis of many years' standing was helped, his physician referred another patient to the clinic.

#### Coordination of Services

Fitting the county rehabilitation clinic into other programs—the State medical rehabilitation program; a recently established county medical social service; a county mental health clinic; and the county public health nursing service—required special attention.

Coordinating the new clinic with the State medical rehabilitation program was comparatively simple because many children who re-



ceive surgery under this program are referred to the rehabilitation clinic. For example, a patient with a cleft palate will be referred for speech therapy following completion of the reparative operation. On the other hand, a person attending the rehabilitation clinic may require braces, which can be purchased under the State rehabilitation program.

Since the county medical social worker is familiar with the State rehabilitation program, she knows many of the patients attending the county rehabilitation clinic, knows their problems, and can help them or assist the clinic therapists in working with them. She can also serve as a liaison between the rehabilitation clinic and the mental health clinic. All recommendations for surgery, braces, or psychological tests are transmitted to her.

Many of the children attending the rehabilitation clinic require psychological testing to determine how much benefit can be expected from rehabilitation therapy. Adult patients who find it difficult to accept their physical handicaps present emotional problems which the mental health clinic team can sometimes treat. Also, when patients attending the mental health clinic are found to have physical handicaps, they are referred to the rehabilitation clinic.

Making maximum use of the public health



nurses in the rehabilitation clinic services, however, called for more deliberation. For several months, mainly because many of the patients attending the clinic were not known to the public health nurses, we pondered the part the nurses would take in the work of the clinic. It was finally decided that they would fit into the program:

1. By referring patients to the clinic and by making the service known to those in need of it.

2. By contributing to the clinic information about factors in the patient's history and background which might affect the treatment plan.

3. By becoming familiar with the needs of patients who require considerable home treatments.

The public health nurse observes treatment in the clinic and becomes acquainted with the patient and, if the patient is a child, with the parent. Then she visits the patient in his home and helps him or the parent learn to carry out treatment in the home situation. In addition, periodic conferences are arranged at which the clinic therapists, the medical social worker, and the public health nurse discuss the progress of the patient and any problems in the home or in the environment which may have a bearing upon the treatment plan and upon the prognosis. The public health nurse develops special skills accessory to the rehabilitation clinic through inservice training.

The rehabilitation clinic team has discussed the services offered by the clinic with the vocational counselor of the State department of education. He plans to meet with the clinic team at regular intervals to discuss cases and to determine whether rehabilitation clinic service would be more practical than to have services paid for under the vocational rehabilitation program.

## Results

Since the clinic commenced operation, the following types of cases have been seen: poliomyelitis, cleft palate, delayed speech, arthritis, cerebral palsy, postural difficulties, multiple

sclerosis, hemiplegia, tongue-tie, clubfeet, tight heel cords, old fractures, orthodontic defects with speech impairments, lisp, hearing loss, knee injury, encephalitis, stuttering, birth injury, stroke, and paraplegia.

The following cases reviewed indicate the results that can be achieved.

**CASE 1.** A little girl, now 4 years old, contracted poliomyelitis in 1953, when she was 2 years old. She was left with a weak and contracted right arm, which she could not use. Physical and occupational therapy were started at the clinic on September 22, 1954, and were continued twice a week until December 1954, when sufficient function had returned to the arm to allow her to use it in feeding herself and in play.

**CASE 2.** A 43-year-old man was diagnosed as having multiple sclerosis. When he was first seen at the clinic, on November 10, 1954, he could not walk except with a cane and by clinging to his wife. At the clinic he was taught crutch balance, coordination, and stair climbing, and within 6 weeks he was walking alone with crutches. Occupational therapy was then started to give him confidence and to train him to make a living.

The patient is now undergoing processing by the New York State Vocational Rehabilitation Bureau, with a view to possible placement in a job. In the meantime, he operates a neighborhood store, selling light lunches, groceries, and articles of leather which he has made at the rehabilitation clinic. His personality has changed completely; self-pity has turned to determination and hope. He is independent to a large degree and is again the head of his family.

By the end of 1954, patients had made 1,130 visits to the rehabilitation clinic; 78 patients had actually been treated, and many of these were still under treatment.

The 1955 health department budget for rehabilitation has been reduced by 36 percent, and this alone is a strong point in selling the program to those responsible for appropriating tax funds for health purposes.

Although much remains to be done, particularly in coordinating the clinic services with services offered by schools and vocational rehabilitation agencies, we feel that the rehabilitation clinic is the nucleus of a workable program aimed at helping the many handicapped persons, both children and adults, in Cattaraugus County.



# Clinical Laboratory Aspects of Leprosy

By LAWRENCE L. SWAN, M.D., and SISTER HILARY ROSS

ALTHOUGH the origins of leprosy probably are rooted in antiquity and the disease has been a dreaded affliction since the beginning of historic time, the etiological agent has been neither successfully cultivated in vitro nor propagated in experimental animals. As a consequence, unequivocal confirmatory laboratory tests are not available in leprosy as they are in other bacterial diseases of man. Nevertheless, numerous observations concerning the results of laboratory studies in leprosy may be found in the world literature.

In this paper, these observations, as well as our own observations based on work done at the Public Health Service Hospital in Carville, La. (the National Leprosarium), and the Public Health Service Hospital in New Orleans, will be presented and discussed in the light of present-day knowledge. It will be seen that the diagnostic laboratory procedures are limited to examination of tissues and that the abnormal clinical laboratory findings reflect, in actuality, the widespread systemic complications and sequelae of leprosy.

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## Bacteriology

The human leprosy bacillus, *Mycobacterium leprae*, was the first organism reported as the etiological agent of a specific disease in man. Despite this fact, it is the only pathogenic bacterium that has not been cultured on artificial media, transmitted to animals, or even transmitted experimentally within the natural host. Attempts to cultivate the leprosy bacillus on artificial media have been innumerable, and positive, as well as negative, results have been reported. The claims of successful cultivation, however, have never been substantiated by other investigators.

Although chick embryos are susceptible to a remarkable variety of bacteria, viruses, and rickettsiae, attempts to infect chick embryos and chick tissue cultures with leprosy bacilli have also met with failure (1).

In 1947 Hanks studied the effect of adding *Myco. leprae* to actively growing fibrocytes obtained from the skin of patients with tuberculoid (2) and with lepromatous (3) leprosy. He observed rapid reduction of the organisms to acid-fast debris in the tissue cultures of fibroblasts from the patients with tuberculoid leprosy; the degeneration of the *Myco. leprae* was less rapid with fibroblasts derived from lepromatous lesions. Cultivation from 2 to 7 months did not result in growth of the leprosy bacillus within the fibrocytes.

## Chemistry

### *Serum Proteins*

Most investigators agree that there are profound changes in the serum proteins in leprosy. For the determination of protein values, many



workers have used chemical methods (4-6). The quantitative and qualitative aspects of these methods compare favorably with the more recent electrophoretic methods of fractionating the complex mixture of serum proteins, but the latter methods are more sensitive and may detect abnormal constituents of the protein mixture.

The majority of the workers who have studied leprosy serums by electrophoretic methods have used the moving-boundary type apparatus (7-12). Miguel and his co-workers (13) made use of the Kern apparatus and paper electrophoresis. No specific references were found in the literature pertaining to the examination of serum from leprosy patients by paper chromatography, column chromatography, or ultracentrifugation.

According to most of the references cited, the total proteins are normal or increased in the great majority of leprosy serums. The quantity of albumin is usually moderately reduced, and, in our experience, in one case complicated by amyloidosis, albumin was undetectable by ordinary chemical methods and only poorly demonstrated by paper electrophoresis. There is a moderate to marked hyperglobulinemia in the majority of cases, and, obviously, reversal of the albumin-globulin ratio occurs frequently in leprosy.

There is less unanimity of opinion in regard to the quantity of the various globulin fractions in leprosy. However, it seems that  $\alpha_2$  is the most frequently elevated fraction. Miguel and his associates reported that this fraction was above normal in 69.76 percent of the patients studied (13).  $\alpha_1$  and beta globulin are elevated less frequently, although a majority of the reports specify an increase. All observers noted an abnormal increase of gamma globulin, and in Miguel's study the gamma globulin was above normal in 68.82 percent of the patients.

#### *C-Reactive Protein*

Serum from 100 patients at the National Leprosarium was tested recently for C-reactive protein. This abnormal protein was found in 79 percent of the patients with clinically active lepromatous leprosy and in 30 percent with clinically inactive lepromatous leprosy. It is believed that serial determinations of C-reactive

protein may have some value in following the progress of the inflammatory response to *Mycobacterium leprae* infection.

#### *Liver Function Tests*

Many of the reports of liver function studies in leprosy are based on methods now considered obsolescent or are no longer significant in the light of our better, though still imperfect, understanding of the mechanism of the reactions involved in these procedures (14). As should be expected, the incidence of abnormally high cephalin flocculation and thymol turbidity tests closely parallels the number of serums in which the proteins deviate from normal (15).

Normal values for urobilin and bilirubin in blood and urine were reported by Molinelli and Royer (16). It is important to note that the bilirubin test employing Ehrlich's diazo reagent diazotizes the two amino groups of the sulfone drugs. A positive test for bilirubin, therefore, would be indistinguishable from the reaction produced by the sulfones, a fact which makes this procedure as unreliable in leprosy as other liver function tests.

In our review of the literature, no reports regarding the results of the bromsulphalein excretion test in leprosy were found. Probably, bromsulphalein is excreted by the parenchymal cells in a manner similar to that in which bilirubin is excreted. Therefore, in the absence of jaundice and with normal renal excretion, this test should be one of the more useful procedures in leprosy.

Hopkins and others (17) reported that cholesterol was high in 14 and normal in 27 leprosy patients and that cholesterol esters were increased in the majority. Gomes and his colleagues (18) observed that reduction of serum cholesterol levels was proportional to the gravity of the disease, especially in febrile reactions. Lippi (19) noted that the serum cholesterol fell in patients with the lepromatous type and in those in serious condition. Ross (20) found serum alkaline phosphatase to be within normal limits in 87 percent of 102 patients. There is little information regarding the zinc sulfate turbidity test or the hippuric acid test in leprosy.

At the National Leprosarium laboratory, we have studied a small number of liver biopsy

specimens obtained percutaneously by the Vim-Silverman needle method from patients with active lepromatous leprosy. Hepatic miliary lepromata were easily identified, and *Mycobacterium leprae* organisms were demonstrated by acid-fast staining. Hepatic amyloidosis was demonstrable histologically by crystal-violet stain in the instances in which there was 100-percent absorption of congo red. Our experience with needle biopsies of the liver has been too limited to draw definite conclusions, but the technique seems to be a very promising one for evaluation of hepatic involvement by leprosy and by amyloid. The procedure is not without hazards, however, and all established safeguards should be observed.

#### *Calcium and Phosphorus*

There is disagreement in the observations of investigators regarding serum calcium levels in leprosy. Reports of normal levels (21-23), of hypocalcemia (24) and of hypercalcemia (25) may be found. Wooley and Ross (26) found diffusible calcium to be lower than normal in leprosy patients and that it increased with clinical improvement of the disease. They reported that inorganic phosphorus was normal in uncomplicated leprosy.

Lemaun and others (27) found no relation between serum calcium levels and the bone absorption in leprosy; however, Wooley and Ross reported that in the aforementioned series bone atrophy was shown by radiography in 44 of 53 patients whose serum was studied.

#### *Glucose*

Very little has been reported on carbohydrate metabolism in leprosy since Villela's review in 1938 (24). Certain of the older reports, such as those of Lai (28) and Otsuka (29), mentioned lowering of glucose tolerance. Wayson, Badger, and Dewar (30) stressed the high frequency of disturbance of carbohydrate metabolism in Hawaiian patients. Glycosuria was noted in 23.0 percent of 175 patients, and 80 percent had abnormal glucose tolerance curves.

More recently, Lancepleine (31) reported the frequency of hypoglycemia to be greater in patients with neural leprosy than in those

with lepromatous leprosy, but the number of patients studied was too small to give significance to the observation. Tanioku (32) found some increase in blood sugar in both macular and lepromatous leprosy, but he did not consider it to be specific for leprosy. Sakakibara (33), however, could detect no consistency in occurrence of either hyperglycemia or hypoglycemia.

The sugar content of the blood is determined routinely on admission of patients at the National Leprosarium, and, if it is above normal, a glucose tolerance test is performed. A urinalysis is made at 3-month intervals on every patient. There are usually 20 to 30 patients in the hospital, or about 5.0 to 7.5 percent of the total, who have glycosuria.

#### *Hematology*

In 1949 Kiang and Choa (34) reported the results of the hemograms for 36 leprosy patients and reviewed a few pertinent references dealing with the blood picture in leprosy. Anemia was found to be frequent but never severe, and no morphologic abnormalities of the erythrocytes were noted. The reticulocytes were low, averaging 0.2 percent. For all except 4 patients, the erythrocyte sedimentation rate was increased. Leukocytosis was inconstant, and when present it was only of moderate degree and only in patients with lepromatous leprosy. The differential counts indicated that leukocytosis was due to increased numbers of mononuclear cells; however, in the untreated cases there was a definite neutrophilic shift to the left. Eosinophilia was observed in 36.1 percent of the patients, and the condition was believed not to be due to parasitism.

From the literature and from our own observations it can be stated that anemia in leprosy is seen mainly in the lepromatous type, especially in patients in whom the disease is advanced, is in a reactional crisis, or is complicated by nephrosis. The majority of workers emphasize leukopenia, but at the Carville hospital leukocytosis has been maintained occasionally over a period of years even in uncomplicated cases. Eosinophilia has been mentioned frequently; however, findings at Carville do not substantiate the opinion that leprosy

per se causes an increase in the number of eosinophils.

The erythrocyte sedimentation rate is accelerated in leprosy, especially in the lepromatous type and in mixed types (35). In our experience, there are no characteristic alterations in the bleeding time, coagulation time, or clot retraction.

In bone marrow from patients with leprosy, *Myco. leprae* bacilli are occasionally demonstrated in the smears as well as in the marrow particles. In a series of 32 bone marrows obtained at autopsy, we found bone marrow involvement in 6. Although there is a relatively high incidence of amyloidosis among patients at the National Leprosarium, amyloid has not been convincingly demonstrated in aspiration material from the sternal or iliac crest marrow or from autopsy material. Cytologically, the marrow usually is not remarkable.

The demonstration of *Myco. leprae* in the cytoplasm of leukocytes has been reported. Namba (36) observed the presence of bacilli in both neutrophils and monocytes removed from the buffy layer of sedimented citrated blood. Montel (37) also found bacilli by this method. He nearly always obtained positive results in generalized lepromatous cases, especially during febrile reactions, but never in tuberculoid cases.

*Myco. leprae* bacilli have been observed in dehemoglobinized blood. By examining thick drops of blood dehemoglobinized with water, Clouston (38) obtained 77.7 percent positive results in nodular leprosy. The results were negative in 21 early cases, however, and he concluded that the procedure was of no practical use in detecting early or latent leprosy. Baru (39) laked and centrifuged venous blood and found bacilli concentrated in the sediment. At the National Leprosarium, a similar technique revealed the presence of bacilli in approximately 50 percent of the newly admitted patients with lepromatous leprosy.

Immunology

Serologic Tests for Syphilis

It is generally agreed that there is a high incidence of biologically false positive serologic tests for syphilis in leprosy patients (40). A

clinico-serologic study of 224 patients at the National Leprosarium was made in 1952 (41). The serologic tests for syphilis used were (a) the Kahn standard quantitative; (b) the Kolmer (cardiolipin) quantitative; (c) the VDRL slide flocculation quantitative; (d) the Rein-Bossak slide flocculation quantitative; and (e) the *Treponema pallidum* immobilization (TPI). The reactivity rates were as follows:

	Reactivity rate (percent)
Kolmer-----	63.4
Kahn-----	52.7
VDRL-----	46.9
Rein-Bossak-----	31.8
TPI-----	11.2

It was concluded that the reactivity rate for the *Treponema pallidum* immobilization test appeared to be consistent with the syphilis rate that might be expected in a comparable population group without leprosy.

The majority of the patients considered to have false positive tests for syphilis had lepromatous leprosy. This seroreactivity seemed to diminish with the prolongation of the disease, but there did not appear to be any correlation with the age of the patients. There was no significant relation to seroreactivity in amyloidosis of leprosy, diabetes, or carcinoma.

Universal Serologic Reaction

In his discussion of the universal serologic reaction with lipid antigen, Kahn (42) states that the reaction between tissue lipids and serum upon which serodiagnostic tests for syphilis are based is not primarily a syphilitic reaction but a biologically universal reaction. A special method known as the universal serologic technique seemed to distinguish specific serologic patterns in all human beings and animals. Concerning such patterns, Kahn states, "In lepromatous leprosy, the serologic pattern of the universal reaction is also apparently distinctive; yet, it is entirely different from the serologic patterns noted in either syphilis or yaws." In addition, he indicates that this test should assist in differentiation of the various clinical forms of leprosy.

Ross and Gemar (43) investigated the universal serologic reaction in 130 leprosy patients, 20 of whom had tuberculoid leprosy and 110

of whom had lepromatous leprosy. From analysis of the data, they concluded that there was no indication of any distinctive serologic pattern in lepromatous leprosy. In addition, the data suggested that treatment may alter the type of pattern in this form of the disease. Pinto and Zeo (44) also were unable to confirm a distinctive universal serologic reaction in lepromatous leprosy, and their conclusions were in agreement with those of Ross and Gemar.

### *Human Leprosy Antigen*

Microflocculation tests employing antigens made from human leprosy material, according to the method of Castro (45), have been investigated recently at the National Leprosarium. Serums from 144 normal persons were all negative. Serums from 50 patients with tuberculosis were negative except for one doubtful and one positive test, and serums from 32 patients with syphilis were all negative. The overall results of the microflocculation tests on serums from 219 leprosy patients were as follows:

Tuberculoid, inactive..... 13 negative; 0 positive.  
Lepromatous, inactive..... 4 negative; 2 positive.  
Lepromatous, active..... 23 negative; 177 positive.

These results, which are in close agreement with the original investigations by Castro, indicate that the use of antigens made from human leprosy material may be a worthwhile laboratory procedure in leprosy.

### *Middlebrook-Dubos Hemagglutination Test*

The erythrocyte agglutination test of Middlebrook and Dubos has also been studied at the National Leprosarium (46). In a study of 261 cases of leprosy, it was found that the proportion of high titers was significantly higher in clinically active lepromatous cases with large numbers of bacilli than in quiescent lepromatous or tuberculoid cases. Results in a small number of cases studied repeatedly over a 1-year period suggest that there may be some correlation between the clinical course of the disease and alterations in titer.

### **Spinal Fluid**

In 32 National Leprosarium patients, no characteristic changes were observed in the spinal fluid. This study included cell count; sugar,

chloride, protein, and colloidal gold tests; and a Wassermann complement fixation test. The negative finding is in agreement with the results of other studies (47, 48).

### **Tissue Diagnosis**

From the preceding discussion, it is obvious that the reviewed clinical laboratory procedures offer no pathognomonic diagnostic information in leprosy. At this time, the laboratory procedures which are most likely to be diagnostic of leprosy are limited to (a) microscopic examination of biopsy material and (b) microscopic examination of smears from skin and nasal mucous membrane scrapings (49).

### *Examination Techniques*

It is of considerable importance to select the site of biopsy or smear specimen with care. The margins of macules and areas of infiltration offer the best material.

We prefer that the biopsy specimen be obtained with a sharp scalpel and that it be sufficiently deep to include subcutaneous tissue. In this country, 10 percent formalin solution is preferred as the fixative, and the sections are stained with hematoxylin and eosin. We have found that the Fite-Cambre-Turner modification of the Ziehl-Neelsen stain to be the most satisfactory acid-fast stain for tissue sections.

In obtaining material for a smear, the skin is compressed between the fingers until it blanches, and a very small incision is made with a single edge razor or a scalpel blade. The blade is scraped through the incision at right angles to collect tissue fragments, which are spread on a glass slide. The slide is stained by the Ziehl-Neelsen acid-fast method.

Demonstration of *Myc. leprae* in leproma is not difficult; however, it is usually a laborious task to obtain bacilli in acceptable numbers from the macules of tuberculoid leprosy. Recent reports from India describe simple methods of concentrating the bacilli by tissue homogenization which are superior to the usual skin smears in such cases (51, 52). These methods are being studied at the Carville hospital, and the results thus far tend to confirm the observations of the Indian researchers.

### *Characteristics of Three Leprosy Types*

Lepromatous leprosy, one of the two polar types, is the one usually illustrated in textbooks and found in class slide sets. Except for a characteristic uninvolved zone immediately beneath the basal layer of the epidermis, the dermis is infiltrated by large, pale, mononuclear phagocytes with a slightly granular cytoplasm, the so-called lepra or Virchow cell. In the early stages of the disease, collections of these cells are oriented around capillaries and lymphatics, and, in later stages, they coalesce into homogeneous masses of lepra cells. Acid-fast stains reveal astounding numbers of leprosy bacilli in the cytoplasm and in cystlike structures called globi. Bacilli are also present in walls of vessels. No caseation necrosis or giant cells are seen unless complicating factors have altered the picture. On rare occasions, foreign-body type giant cells are present around the globi.

Tuberculoid leprosy is the other of the two polar types. Its most obvious feature is the presence of epithelioid tubercles with Langhan's type giant cells. No uninvolved sub-basal zone is present, and the picture is closely mimicked by some cases of sarcoid of the skin, tuberculosis, beryllium granulomas, and other granulomatous cutaneous lesions. In a study of the histological differentiation of nonleprous and leprous cutaneous tuberculoid granulomas at the Armed Forces Institute of Pathology, one of the authors (Swan) and Dr. Chapman H. Binford concluded that nerve involvement is seen almost exclusively in the leprosy cases. *Mycobacterium leprae* bacilli are infrequently seen in tuberculoid leprosy, although a few may be found in most cases if a determined and vigorous search is made.

What is known as the indeterminate type of leprosy is histologically nonspecific. In this type the presence of acid-fast bacilli is rather infrequent. The dermal reaction consists of perivascular and perineural lymphocytic infiltration.

### **Summary and Conclusions**

The cultivation of *Mycobacterium leprae* is probably the one most important goal sought by leprologists. Conclusive proof of the pres-

ence of leprosy, exact determination of activity, precise evaluation of therapeutic agents, and development of specific diagnostic tests await the cultivation of this organism. The leprosy bacillus appears to be an intracellular parasite, and it is possible that with present-day tissue culture techniques the organism will be successfully grown in vitro.

The abnormal values of serum proteins generally are considered to be due to the response of the reticuloendothelial system to leprosy bacilli. It is important to evaluate the protein values in leprosy according to (a) the type of leprosy from which the serum is obtained and (b) the activity of the disease and complicating conditions, such as amyloidosis and renal disease. It is apparent that in almost all cases of lepromatous leprosy there are abnormalities of serum proteins. The globulins are increased during acute lepra reactions and erythema nodosum leprosum, and they subside as the erythema disappears. Abnormalities of the serum proteins are rare in tuberculoid leprosy. In view of the frequency of complicating amyloidosis in leprosy, the evaluations of serum proteins are significant, especially in the light of recent evidence suggesting that amyloidosis seems to be related to the appearance of beta and alpha<sub>2</sub> globulins in the blood of experimental animals (53).

The cephalin flocculation and thymol turbidity tests are abnormal in leprosy because of the quantitative, and possibly the qualitative, variations in the serum proteins. The reduction of serum cholesterol levels, as reported by most observers, is more in keeping with what is known concerning cholesterol metabolism and excretion. The relationship between free and esterified cholesterol seems not to have been adequately studied in leprosy. The low serum cholesterol levels in active lepromatous leprosy suggest that there is hepatic involvement, a condition which the finding of lepromata and organisms in needle biopsies of the liver seems to confirm.

Other clinical chemistry tests reviewed do not appear to be altered by leprosy per se.

Hematology offers little in the diagnosis of leprosy. The presence of organisms in the cytoplasm of circulating leukocytes or in smears from laked blood is usually seen only in cases

in which organisms can be demonstrated more easily from smears of cutaneous lesions. Bone marrow examination likewise contributes little to the diagnosis of the disease.

False serologic tests for syphilis in leprosy are well known and have made the diagnosis of concurrent syphilis difficult unless spirochetes are demonstrated. The recent results of the *Treponema pallidum* immobilization test in patients with leprosy suggest that the false biological positive reactions have been eliminated.

The Middlebrook-Dubos hemagglutination test reveals that leprosy probably produces antibodies which cause agglutination of red blood cells that have been sensitized with tuberculin. The microfloculation test of Castro, from the serologic point of view, may be assumed to be a diagnostic test for leprosy. We believe that this test may be of value as a routine laboratory procedure in the detection of overlooked cases of lepromatous leprosy in endemic areas.

It is our opinion that at the present time examination of tissues is the best method of making a laboratory diagnosis of leprosy and of classifying the disease as to type. The concentration of organisms by homogenization of tissue is perhaps the method most likely to demonstrate organisms in all types of leprosy. Meticulous technique and cautious interpretation of results are essential for proper utilization of this procedure.

#### REFERENCES

- (1) Hanks, J. H.: Attempts to infect chick embryos and chick tissue cultures with bacilli from human lepromatous lesions. *Internat. J. Leprosy* 15: 70-77 (1947).
- (2) Hanks, J. H.: The fate of leprosy bacilli in fibroblasts cultivated from macular and tuberculoid lesions. *Internat. J. Leprosy* 15: 31-47 (1947).
- (3) Hanks, J. H.: The fate of leprosy bacilli in fibroblasts cultivated from lepromatous lesions. *Internat. J. Leprosy* 15: 48-64 (1947).
- (4) Ross, Sister H.: Studies on the serum proteins in leprosy. The alpha, beta and gamma globulin fractions. *Internat. J. Leprosy* 19: 445-452 (1951).
- (5) Stevenson, W. D. H.: Complement deviation and globulin content in the blood of lepers. *Indian J. M. Research* 12: 583 (1925).
- (6) Wooley, J. G., and Ross, Sister H.: Calcium, phosphorus and protein metabolism in leprosy. A study of the total calcium, diffusible and non-diffusible calcium, phosphorus, total proteins, albumin, and globulin in the blood serum. *Pub. Health Rep.* 47: 380-389 (1932).
- (7) Hoxter, G., Batista, L., and Vellini, L. L.: Estudos eletroforéticos nas diversas formas clínicas da lepra (with English summary). *Rev. Brasil de Leprol.* 19: 27-40 (1951).
- (8) Kono, M., Tsugami, H., and Sakurai, H.: On serum protein components and leucocyte percentage in erythema nodosum leprosum. *La Lepro* 21: 98-102 (1952); Abstract in *Internat. J. Leprosy* 21: 411 (1953).
- (9) Mauzé, J., and Arnaud, G.: L'électrophorèse du serum de lèpreux (with English summary). *Internat. J. Leprosy* 22: 55-60 (1954).
- (10) Mayama, A.: Electrophoretic studies on the protein distribution in the serum of leprosy patients. *Se. Rep. Res. Inst. Tohoku Univ. Ser. C.* 5: 273-282 (1954).
- (11) Namba, M., and Fujiwara, H.: Studies on the electrophoresis of leprosy serum. *La Lepro* 21: 5-10 (1952); Abstract in *Internat. J. Leprosy* 21: 5 (1953).
- (12) Seibert, F. B., and Nelson, J. W.: Electrophoresis of serum; Serum proteins in tuberculosis and other chronic diseases. *Am. Rev. Tuberc.* 47: 66-77 (1943).
- (13) Miguel, S., Roldan, A., Guillen, J., Teremio, J., y Ponceiani, J.: Proteínas plasmáticas en la lepra. *Internat. J. Leprosy* 22: 47-54 (1954).
- (14) Hanger, F. M.: The meaning of liver function tests. *Am. J. Med.* 16: 565-573 (1954).
- (15) Ross, Sister H.: The thymol turbidity and cephalin-cholesterol tests, euglobulin, albumin-globulin ratio and serology in leprosy. *Internat. J. Leprosy* 17: 237-245 (1949).
- (16) Molinelli, E. A., and Royer, M.: La urobilina y bilirubina sanguínea y urinaria en la lepra. *Semana méd.* 3: 1799-1801 (1929).
- (17) Hopkins, R., Black, S., and Ross, Sister H.: Xanthelasma and leprosy. *Arch. Dermat. & Syph.* 39: 239-252 (1939).
- (18) Gomes, J. M., Pereira Leitao, C. A., and Waneolle, A.: Cholesterinemía na lepra. *Rev. Biol. Hyg.* 1: 39-52 (1927).
- (19) Lippi, M.: La colesterinemía nella lepra. *Arch. ital. se. med. trop.* 31: 266-273 (1950); Abstract in *Internat. J. Leprosy* 19: 257 (1951).
- (20) Ross, Sister H.: Serum phosphatase in leprosy. *Internat. J. Leprosy* 9: 57-61 (1941).
- (21) Concepcion, I., and Salcedo, J. F.: The calcium content of blood in leprosy. *J. Philippine M. A.* 6: 154-157 (1926).
- (22) Cruz, M. C., Lara, C. B., and Paras, E. M.: Blood calcium in leprosy. *J. Philippine M. A.* 8: 216-221 (1928).
- (23) Morales-Otero, P., and Hernandez, L. G.: II Studies of the blood chemistry of leprosy. Analysis of findings of fifty cases. *Puerto Rico J. Pub. Health & Trop. Med.* 5: 443-451 (1930).

- (24) Villela, G.: The biochemistry of leprosy. A review. *Internat. J. Leprosy* 6: 61-72; 223-232 (1938).
- (25) Herrera, R. M.: La calcemia en los leprosos. *Siglo med.* 95: 394-396 (1935); Abstract in *Internat. J. Leprosy* 4: 544 (1936).
- (26) Wooley, J. G., and Ross, Sister H.: Phosphorus, total calcium and diffusible calcium content of the blood sera of lepers and their relation to bone changes. *Pub. Health Rep.* 46: 641-658 (1931).
- (27) Lemann, I. I., Liles, R. T., and Johansen, F. A.: Blood serum calcium in leprosy. *Am. J. Trop. Med.* 7: 61-70 (1927).
- (28) Lai, D.: The dextrose tolerance test in leprosy. *Am. J. Trop. Med.* 14: 575-584 (1934).
- (29) Otsuka, H.: On the sedimentation phenomena of red blood-cells and the amount of total nitrogen, non-protein nitrogen, fibrin nitrogen and sugar in the blood of lepers (with English summary). *Japanese J. Dermat. & Urol.* 33: 127-169 (1933).
- (30) Wayson, N. E., Badger, L. F., and Dewar, M.: Leprosy with evidence of abnormalities in carbohydrate metabolism. *Pub. Health Rep.* 44: 2971-2983 (1929).
- (31) Lanceplaine, J.: Cholesterinémie, calcémie, and glycémie, chez les lépreux de l'A.O.F. *Méd. trop.* 9: 502-518 (1949); Abstract in *Internat. J. Leprosy* 19: 257 (1951).
- (32) Tanioku, K.: The chemical views of the blood in leprosy (with English summary). *La Lepro* 19: 24-28 (1950).
- (33) Sakakibara, I.: Blutzuckergehalt des lepra-serums. *La Lepro* 7: 29 (1936); Abstract in *Internat. J. Leprosy* 5: 541 (1937).
- (34) Kiang, S., and Choa, G. H.: The blood picture in leprosy. *Am. J. Med. Sc.* 217: 269-276 (1949).
- (35) Faget, G. H.: Erythrocyte sedimentation tests in leprosy. Statistical study of more than 2000 tests in more than 500 patients. *Ann. Int. Med.* 22: 212-224 (1945).
- (36) Namba, M.: A new method of demonstrating lepra bacilli in the circulating blood. *Japanese J. Dermat. & Urol.* 44: 192 (1938); Abstract in *Internat. J. Leprosy* 8: 135 (1940).
- (37) Montel, R.: Bacillemia of leprosy. Staining characters of Hansen's bacillus. *Bull. Acad. Med. Paris* 130: 165-168 (1946); Abstract in *Internat. J. Leprosy* 17: 361 (1949).
- (38) Clouston, T. M.: An investigation into the thick blood-drop method of diagnosis in leprosy. *M. J. Australia* 2: 430-432 (1936).
- (39) Barua, K. C.: A new method of examining the blood in leprosy. *Indian M. J.* 32: 512 (1938).
- (40) Parran, T., Hazen, H. H., Mahoney, J. F., and others: Preliminary report on the Washington Serology Conference. *Ven. Dis. Inform.* 23: 161-194 (1942).
- (41) Edmundson, W. F., Woleott, R. R., Olansky, S., and Ross, Sister H.: A clinico-serologic study of leprosy. 1. Results of serologic tests for syphilis, including *Treponema pallidum* immobilization test. *Internat. J. Leprosy* 22: 440-449 (1954).
- (42) Kahn, R. L.: Serology with lipid antigen with special reference to Kahn and universal reactions. Baltimore, Md., Williams and Wilkins, 1950, p. 39.
- (43) Ross, Sister H., and Gemar, F.: The Kahn universal serological reaction in leprosy. *Internat. J. Leprosy* 21: 27-33 (1953).
- (44) Pinto, T. J., and Zeo, A.: Universal serologic reaction in leprosy. *Ann. New York Acad. Sc.* 54: 48-52 (1951).
- (45) Olmos Castro, N.: Contribution to the study of the serology of leprosy. *Internat. J. Leprosy* 19: 309-321 (1951).
- (46) Ross, Sister H.: The results of a modified Middlebrook-Dubos hemagglutination test in leprosy. *Internat. J. Leprosy* 22: 174-180 (1954).
- (47) Koenigstein, R. P., and Chang, S. T.: Colloidal gold reaction in the spinal fluid in leprosy. *Internat. J. Leprosy* 19: 323-326 (1951).
- (48) Molinelli, E. A., and Vaccarezza, A. J.: The cerebrospinal fluid in leprosy. *Rev. Soc. argent. de biol.* 5: 428-434 (1929).
- (49) Swan, L. L.: The laboratory diagnosis of leprosy. *J. Louisiana Med. Soc.* 106: 411-413 (1954).
- (50) Fite, G. L., Cambre, P. J., and Turner, M. H.: Procedure for demonstrating lepra bacilli in paraffin sections. *Arch. Path.* 43: 624 (1947).
- (51) Dharmendra and Mukherjee, N.: A simple method of concentration of leprosy bacilli from "closed" cases of leprosy. *Leprosy in India* 24: 169 (1952).
- (52) Khanolkar, V. R., and Rajalakshmi, K.: A method for concentration of acid-fast bacilli in skin biopsies from leprosy patients. *Leprosy in India* 24: 47-61 (1952).
- (53) Riechter, G. W.: Amyloidosis and increased beta globulins of the serum in rabbits given ribonucleotide. *Am. J. Path.* 29: 583-584 (1953).



## *Conference Report*

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SIX BRIEFS of papers presented at the 13th annual meeting, May 6-9, 1955, Mexico City, appear on the following pages. The official publication of the association is the *Boletín de la Oficina Sanitaria Panamericana*, in which one may expect to find Spanish versions of the conference papers.



# Good Health at the Border

**PHR** Unsolved public health problems exist at practically every point where communities meet at the boundary line between the United States and the Republic of Mexico. But none are of greater magnitude than the public health conditions along the Rio Grande, which separates Texas and Mexico.

Morbidity statistics per 100,000 population for 1953 illustrate the lack of good health in the 11 border counties of Texas. The tuberculosis morbidity rate is 128.8; for the entire State it is approximately 56.8.

Gonorrhea and syphilis rates for the entire State are 267.2 and 89.4; for the 11 border counties they are, respectively, 397.3 and 199.5.

Bacillary dysentery and amebic dysentery rates for the entire State are 197 and 6.5; for the 11 border counties they are 923.6 and 30.2.

The infant mortality rate, one of the most sensitive indicators of the state of public health in any population was 48.7 per 1,000 live births in these 11 counties; for the entire State it was 34.3.

One border county annually reports 3 times the number of shigellosis cases that are reported by all the other 253 counties of Texas.

The flow of migratory labor into Texas has increased the scope of public health problems in the border counties. Little has been done, however, to meet the health needs of incoming legal "braceros." Frequently, labor contractors neglect making arrangements for the health, safety, and comfort of the migratory workers they transport.

Rest stations have not been provided at strategic points for these people in transit. Little in the way of proper housing and basic sanitary facilities has been provided for these laborers at their employment destinations.

## Standard Health Units

What can be done to help us reach our mutual goal of good health at the border? Most prob-

lems of public importance can be solved by the community when people understand the necessity of finding a solution to their problems.

The satisfactory solution of community health problems can best be approached through the services of a standard full-time health unit. Local health units or their counterparts along each side of the boundary line would eventually achieve our mutual goal.

I hope to be able to report at some future meeting of the United States-Mexico Border Public Health Association that every county on the Rio Grande is served by an accredited full-time health unit and that all other Texas counties are also covered by such a service.

The basic professional team needed for the local health unit consists of—

- One or more licensed physicians who have had graduate training in public health administration.
- At least one dentist with training in public health dentistry.
- A corps of nurses who are qualified through training, experience, and skill to give communitywide public health nursing.
- A sanitary engineer and a sufficient number of properly trained sanitarians to assure the environmental safety of the local community.
- Skilled laboratory personnel to verify and support the technical efforts of other staff members.
- A trained and skilled health educator to correlate the educational effort of the unit.
- Sufficient nonprofessional personnel to carry out the routine work of the unit.

Functioning on a county or multicounty basis, the standard health unit—

- Collects and analyzes morbidity and mortality statistics, for use in planning and carrying out programs aimed at raising local health standards.
- Makes epidemiological studies and, in cooperation with the local medical profession, institutes appropriate measures in the control of communicable or preventable diseases.
- Supervises and administers a continuing program of environmental sanitation, which will assure the community a safe water supply, proper disposal of industrial and human waste, protection of all food sources, control of insects

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*By Henry A. Holle, M.D., State health officer, Texas.*

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## Setting the Pattern

The United States-Mexico Border Public Health Association has demonstrated that our two countries can live peacefully side by side and solve our problems at the council table in a democratic fashion. Learning to live peacefully with one's neighbor is one of the highest attainments yet to be reached in the public health field.

—Victor M. Ehlers, director, division of sanitary engineering, Texas State Department of Health, Austin, Tex.

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and rodents, and the elimination of health hazards and nuisances.

- Conducts projects to promote better health for mothers and children, through maternal and child health clinics.
- Promotes dental health, through clinical demonstrations, education in dental hygiene, and corrective services provided by local dentists.
- Provides those laboratory services which are prerequisite and directly related to the successful administration of the overall public health effort in the community.
- Carries out consistent programs of community education through available channels, to guide individuals and groups toward better individual and community health.

### Border Health Units

In developing local health units along the border, we shall give special attention to staffing with persons who speak English and Spanish fluently, and who are best qualified to cope with the health problems common to all communities along the Rio Grande. These communities will cooperate with Mexican health authorities in every possible way.

Much has been gained by public health personnel who participated in the environmental sanitation training seminar at Laredo, Tex., sponsored by the Pan American Sanitary Bureau, the Ministry of Health and Welfare for Mexico, the United States Public Health Service, and the Texas State Department of Health.

The success of the seminar points to the great need for a special training agency to reach all types of health workers on both sides of the in-

ternational boundary. In the event the establishment of a special agency is not immediately possible, we can all work toward expanding in-service training programs along the border to include all categories of health personnel from both countries. It is desirable that we also work out a program for the exchange of public health personnel working on each side of the border.

Even with the very best international and international cooperation, we still face an uphill fight. I venture to say that it was best we did not adopt a plan considered in the 1930's, which would have turned over to an international commission the matter of public health administration in the border counties and municipalities. It would have destroyed local initiative in developing adequate community public health resources. Properly staffed and equipped local health departments, encouraged and assisted by state and federal governments, can ultimately attain our goal.

## A Natural Resource

**PHR** Under construction in Mexico City and soon to be completed is the sewage treatment plant of Chapultepec. From the sewage the plant will produce liquid activated sludge and humus for agricultural purposes.

The new plant will be used as an experimental laboratory for the Sanitary Engineering School of the National University of Mexico. This school is sponsored by the Ministry of Health and Welfare through its division of experimental studies in public health. Other research will be conducted at the several installations of the sewage treatment plant.

Soon to be in operation is a pilot plant to treat the sewage of the Grand Canal, Mexico City. Over a year's time, a daily chemical analysis has been made of 24-hour composite samples. The outcome of this study will de-

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*By Raúl Enrique Ochoa Elizondo, engineer. Departamento de Obras Hidráulicas del Distrito Federal. México, D. F.*

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termine the design of corresponding subsidiary installations.

For more than 10 years the problem of treating sewage in Mexico City has been a cause for public concern. During this period the problem was aggravated by a diminishing water supply.

The falling level of Xochimilco Lake, one of the main tourist attractions of Mexico City, led the Departamento del Distrito Federal to endeavor to preserve the lake and by so doing to improve its actual sanitary condition. The department has recommended that treated sewage be used to supplement the rainwater that normally flows into the lake in order to maintain the water level.

The water in some of the wells formerly used for watering public gardens has been exhausted. This is true particularly of the Bosque de Chapultepec, which is the main public park in the city.

As part of the general attempt to solve the problems of sewage and water supply, it is planned to establish a closed cycle in the rational use of the waters in the Mexico Valley basin. It is economically desirable to take part of the city water supply from the deep ground water in the valley, which at present is used for irrigation purposes, and to use the treated sewage for irrigation. The sludge is also used for fertilizer to replace the nutrients removed from the soil.

## Wildlife Rabies Control

**PHR** Rabies is as much, or more, a problem of agricultural economics as it is of public health. During 40 years' experience in controlling animals harmful to man, the Fish and Wildlife Service of the United States Department of the Interior

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*By Clifford C. Presnall, assistant chief, Branch of Predator and Rodent Control, Fish and Wildlife Service, United States Department of the Interior, Washington, D. C.*

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### Exchange of Rabies Reports

We recognize the importance of mutual cooperation in solving the problems of rabies along the United States-Mexico border. The Texas-Mexico border is long, and the Rio Grande River is not an effective barrier against the rabies virus.

Let us attempt to share reports on the laboratory findings of rabies along the border. The Texas State Health Department will be pleased to send its monthly report on rabies and other animal diseases to interested persons in Mexico. In exchange we would appreciate having copies of similar reports and other significant information regarding rabies along the border.

—J. V. Irons, M.D., director of laboratories, and R. B. Eads, Ph.D., principal entomologist, Texas State Department of Health, Austin, Tex.

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has learned two basic truths about rabies in wildlife.

The disease can often be stopped, or greatly limited, by reducing without actually exterminating the population of wolves, coyotes, and foxes. Rabies epidemics seldom start where these animals are kept from becoming too numerous.

The numbers of these animals can be kept low without great expense and without danger to beneficial animals, domestic stock, or mankind. An incidental benefit is a reduction in the number of livestock killed and eaten by predators.

Applied with success for many years in the United States, these principles have been used with good results along the border between Mexico and the United States. Since the informal Nogales agreement was made on April 26, 1949, a joint program of rabies control demonstrations has operated in a 150-kilometer zone on both sides of the boundary.

### Regular Predator Control

All of the work north of the border has been part of the regular predator control program which the Fish and Wildlife Service operates in cooperation with State and county agencies and local livestock associations. This work has

kept predators from becoming abundant along much of the border with the result that there has been little rabies among either wild or domestic animals.

During the past 6 years there have been only two outbreaks of rabies among wildlife in the control zone: one among coyotes and foxes in San Diego County, Calif., and the other in Santa Cruz County, Ariz. A few other cases of rabies have been known among domestic animals in Arizona also.

In the New Mexico portion of the zone there has been no wildlife rabies reported during this time. Texas reported only one rabid coyote along the border.

South of the border the amount of rabies reported among wildlife has been equally small. Within the zone, however, few animal heads have been available for examination because there has been little trapping of foxes and coyotes.

Public interest in coyote and wolf control has been most active in border areas of Chihuahua, Sonora, and Baja California. Six small demonstrations of control methods have been held in these Mexican states since the agreement for joint action—all with the joint aid of the Pan American Sanitary Bureau, the United States Fish and Wildlife Service, federal or state agencies, and local livestock associations.

In Chihuahua, and to some extent in Sonora, the local livestock associations have carried on the work during the intervals between demonstrations. In all demonstrations, the work has been hampered by movement of wolves and coyotes from large uncontrolled areas into the small controlled areas. Results of the demonstrations show that similar work all along the border would be desirable. These results are best shown west of Nueva Casas Grandes, Chihuahua, where control has been effective during the past 5 years in an area which varied from 1,000 to 4,000 square kilometers.

A recent survey of the Casas Grandes area revealed a low population of wolves and coyotes, similar to many parts of the United States where no rabies outbreaks have occurred since the excess numbers of predators were first reduced some 35 years ago. The wolf and coyote population is now low enough to make it unlikely that rabies could spread rapidly. There

has also been a great reduction in loss of livestock since predators were controlled.

Ranchers report that the number of sheep, calves, and other livestock killed by predators is now only a small fraction of the number killed before 1950. One herd of cows produced twice as many calves in the year after predator control as in the year before. Thus, the work directly benefits both the health and economics of the area.

### **Economic Benefits**

Economic benefits are more easily seen by cattlemen than are health benefits. It is logical for them to support measures which help raise and sell two calves rather than one. Most people give little thought to benefits to health until they become sick. Then it may be too late.

The same applies to rabies control, which is seldom given any attention until the outbreak occurs. By controlling the domestic and wild carriers of rabies before an epidemic starts and by removing the excess numbers of wolves and coyotes, continuously and on a wide scale, we can decrease the danger and expense of repeated local outbreaks.

The small rabies control areas along the United States-Mexico border have demonstrated the suitability of methods for preventing spread of the disease among wildlife and of reducing livestock losses. The time now seems ripe for action which will aid broad-scale application of the idea throughout the entire border zone.

## **Mosquitoes and Encephalitis**

**PHR** An epidemic of St. Louis encephalitis in August 1951 affected 600 people in Hidalgo County, Tex., causing at least 2 deaths. Local physicians, baffled by the nature of the disease, called it poliomyelitis. Naturally, alarm re-

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*By Sam L. Warrington, B.S.C.E., sanitary engineer,  
Hidalgo County Health Unit, Edinburg, Tex.*

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sulted from reports of 92 cases of "poliomyelitis" in 1 week.

### Countywide Control

Hidalgo County has a population of 180,000, with 12 cities ranging in size from 5,000 to 25,000. The county lies on a flat delta on the Rio Grande across from Tamaulipas, Mexico. A vast irrigation and drainage system affords many ideal mosquito-breeding potentials.

No mosquitoes in the area had been known to transmit encephalitis. *Culex quinquefasciatus*, the most numerous species, proved to be the vector responsible for carrying the encephalitis virus from wild birds to man.

Working on the assumption that the Hidalgo County epidemic was mosquito-borne, insect control specialists began a mass mosquito-killing campaign. The county health unit furnished the supervision, equipment, and crews for larviciding all breeding places within each city and for about a mile around the fringe areas. The cities paid for the chemicals used for spraying and for the gasoline for the trucks.

At first we thought that we could control the mosquitoes by finding and larviciding all the water holes. It didn't take long to discover that we were missing too many breeding places on private premises for this measure to be effective. To kill the larvae, 5 percent DDT and diesel oil were applied on all standing water. To kill adult mosquitoes, a 3 percent gamma isomer benzene hexachloride (BHC) dust and 5 percent DDT and water were used in turbine sprayer-dusters in all of the cities.


The epidemic began to subside before the mosquito control activities had been completed in all the cities. Continuous collections of mosquitoes are being made and studied by the laboratories, however. As late as January 1955, the virus was still present in the mosquitoes. Since then, two cases of encephalitis have been reported, although one patient later was found to be suffering from a blood clot.

In the likelihood of another epidemic, unless mosquito control continues, it is planned that the county and cities will share the expenses of control operations. For adult mosquito control, the cities which have fogging machines or dusting equipment will continue to fog with them. For the cities which do not have space-

spraying equipment, the county health unit has purchased a jeep-mounted turbine sprayer-duster. Space spraying will be done for the cities on a fee basis.

From our mosquito control efforts we have learned that larviciding plus fogging with 5 percent DDT and diesel oil in a dynafog gave good control for about a week. Larviciding plus space dusting with 3 percent gamma BHC and space spraying with 5 percent DDT and water gave good control for a longer period than with the fogging machine.

## El Paso-Juarez Area

 El Paso and Juarez are the two largest cities in their respective countries on the United States-Mexico border. They are contiguous, being separated only by the Rio Grande, a narrow sandy stream which can be waded most of the year round. The northbound traffic amounts to 18 million people a year. Southbound traffic is only slightly less. Thus, there are many joint sanitation problems.

### Joint Insect Control

Mosquitoes, more of a nuisance than a public health problem, breed in thousands of ditches, irrigation boxes, and culverts—all close to thickly settled suburban developments. Most of these breeding areas can be reached only by foot. The breeding is enhanced by the fact that much of the Mexican irrigation water contains a high percentage of sewage, which tends to seal the ground, preventing the water from drying away between irrigations. The sewage also furnishes abundant organic matter to feed the larval stage.

For control, we use 5-gallon knapsack sprayers containing stove oil of 40 gravity with 2 percent benzene hexachloride (BHC) in solution. The oil is sprayed on the mosquito-breeding water surfaces and effects a suitable kill. The

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El Paso Health Department furnishes the equipment, insecticide, and some supervision, and the Juarez Health Department furnishes the labor and some supervision.

The housefly does not recognize international boundaries either. In addition to the usual fly sanitation control, we have a supplementary program which consists of spraying garbage cans and pit privies along public streets and alleys with a residual type of insecticide. This is a concurrent program with Juarez rather than a joint program.

Because flies rapidly become resistant to various residual chemicals, we change insecticides each year. We plan to change to malathion, DDT, and a new product called Die-Fly. Sugar is added to attract the flies.

A few years ago the Texas State Department of Health conducted a 4-day course for training health department personnel and people in industry responsible for fly control. Six inspectors from the Juarez Health Department attended the course, held in El Paso.

### **Voluntary Cooperation**

As a result of the efforts of the first international committee on diarrhea and enteritis, in El Paso the infant death rate per 100,000 has dropped from 54.6 in 1951 to 13.6 in 1954, and Juarez has had a similar improvement. Representatives from the two cities form the committee which was organized several years ago.

Theirs is a completely voluntary program, sponsored by the two local health departments and the Central Council of Social Agencies. Volunteers armed with demonstration equipment and pamphlets have visited each home in areas having the most cases of diarrhea and enteritis. Mothers were told how to protect their child's food and what to do when the child first shows signs of illness.

El Paso has oil refining, smelting, brickmaking, woodworking industries, packinghouses, railroads, quarries, and a fertilizer plant. For several years we have had a voluntary program of air pollution abatement. Our mayor set up a smoke control committee to work with the industries on a voluntary abatement program. When we had made every improvement possible by this means, we recommended a smoke control ordinance, but industry promptly proposed

that it set up its own policing committee to handle individual complaints and to strive for further air pollution abatement. This is the program now in effect.

The Rio Grande flow has been decreasing for years. At the same time, the waste load has been rising. Stream pollution is heavy with discharges from sewage plants and industries. Only a small part of this pollution comes from Mexico.

El Paso is building a secondary sewage treatment plant to treat an effluent of about 12 million gallons daily. The El Paso County water improvement district is building two other secondary treatment plants. A large packinghouse has built a plant to treat its waste discharges. These latter treated discharges, now used for irrigation on Mexican soil, no longer enter the Rio Grande directly except in winter.

By mixing sewage with irrigation water and well water and using the mixture for land irrigation, Juarez has corrected an odor nuisance caused by the discharge of sewage into a drainage ditch parallel to the river.

### **Ways of Cooperating**

When El Paso and Juarez conducted a joint rat-typhus survey in 1946, sampling points were set up in both cities. Men from both health departments worked side by side in the program. Although neither city had any human cases of typhus, 25 percent of the rats caught were infected. In the 1951 survey 5 percent of the rats were infected.

The sanitary landfill in El Paso was located adjacent to Cordova Island, a portion of Mexico north of the river. A wire fence is the international boundary at that point. The health officer of Juarez protested the location of the fill, stating that he had an almost impossible police problem to keep citizens from crossing the fence to rummage in the fill for salvage, which he felt was a health menace. Locating another site for the fill away from the boundary solved the international phase of this problem.

Vegetables, pineapples, strawberries, bananas, and shrimp are part of the international food traffic from Mexico to the United States. The United States sends corn, beans, and rice into Mexico. All foods are inspected on both

sides of the river. One El Paso company proposes to import grade A milk from a Juarez dairy. Another proposes to import ice if our local requirement that ice be manufactured from distilled water can be met.

Many of the sanitarians in the Juarez Health Department have earned certificates from our food-handlers school. Juarez has initiated a similar school.

There is no "iron curtain" here. The only curtain between our two cities is an occasional curtain of dust, not man-made. Cooperative, friendly relations exist between us and our esteemed Mexican neighbors.

## Mosquito Source Reduction

PHR

It is understandable why mosquitoes have become and bid to be even more of a formidable problem to the State of California. The water resources of the State are now developed to approximately one-half of that planned. The State will have approximately 17 million irrigated acres when all the irrigable land is developed. The present irrigated acreage is about one-fourth of all the irrigated land in the United States.

California's mosquito abatement problem is dealt with by more than 50 local control programs. The control technology utilizes preventive and corrective environmental measures, augmented chiefly by insecticides. Scientific studies are seeking improved methods of control, of mosquito measurement, of neutralizing the vector of encephalitis.

### A Changing Problem

Organized mosquito abatement has been in existence in California for more than 40 years. During this time four distinct periods have characterized control effort. They might be classed as follows:

*Reclamation period*—This period utilized the

engineering approach in obtaining control since the principle of drainage was the foremost control measure employed. Extensive land reclamation was the result.

*Petroleum period*—To a great extent petroleum oils served as a partner to drainage during the reclamation period, being relied on increasingly from the beginning of organized mosquito control in California through World War II.

*Chlorinated hydrocarbon period*—The movement leading from DDT's dramatic initiation by the military forces during the war to its almost unrealistic use for civilian purposes later served to the detriment of the environmental sanitation approach toward mosquito abatement and fly prevention. Nature soon responded, and after several years domestic flies and certain mosquitoes became clearly resistant to DDT, lindane, toxaphene, chlordane, heptachlor, aldrin, and dieldrin.

*Mosquito source reduction period*—Partly in response to insecticide resistance, there has been a return to progressive elimination of mosquito sources through engineering methods.

The primary reason for this shifting emphasis has been in response to a changing mosquito problem, arising to a great degree from the accelerated program of water resources development. The increase in irrigation practices, the rapid growth in population, and the rapid industrialization of the State are also contributing factors.

### The Present Program

Our State and local program is of necessity hinged on preventing mosquitoes from developing at their source. Provision of adequate drainage or for re-use of excess water in new irrigation developments, effective land preparation, and judicious land and water management practices are our means for prevention of new mosquito problems.

Efforts are being made to get cooperation from other public agencies. Close working relationships have been developed between the farm advisers and the mosquito abatement districts and with irrigation districts, soil conservation agencies, and wildlife interests. Insecticides are relied on as supplemental measures. Wherever mosquito resistance to chlorinated hydrocarbon insecticides has devel-

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By Richard F. Peters, B.S., chief, bureau of vector control, and Frank M. Stead, M.S., chief, division of environmental sanitation, California State Department of Public Health.

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oped, phosphate-type insecticides have been substituted.

The bureau of vector control of the California State Department of Public Health is studying the ecology of the important mosquito species in the State as a basis for determining the most efficient control measures.

Every aspect of irrigation practice and mosquito production on irrigated pastures is being investigated with the aim of trying to break the mosquito life cycle at its most vulnerable point. The belief exists that the most probable gains in control can be made in positively or negatively influencing egg hatching.

A companion study of mosquitoes in rice fields is likewise receiving attention. Both *Culex tarsalis*, the vector of encephalitis and the most common mosquito in the State, and *Anopheles freeborni*, the vector of malaria, flourish in a ricefield habitat. The most promising lead is related to the influence of blue-green algae upon mosquito larvae.

An ecologic study of mosquitoes in row crops, particularly in cotton fields, is now under way. California has approximately 1 million acres of cotton. The full importance of this crop to mosquito production is only vaguely understood.

#### Encephalitis Studies

The two important types of encephalitis in California, the western equine and St. Louis

strains, are transmitted principally by *C. tarsalis*. The disease is endemic in the Central Valley, but infection has also been recorded in other areas.

In an effort to seek more information about encephalitis and its relationship to humans, horses, mosquitoes, and other intermediate animals, several bureaus of the State health department, as well as the Hooper Foundation for Medical Research, the University of California School of Public Health, and the Public Health Service, are engaged in intensive research.

The department is making annual collections of *C. tarsalis* on a weekly basis from May 1 until October 31. Fifty pools a week are processed for the presence of the encephalitis virus by the State viral and rickettsial disease laboratory.

Attempts are being made to interpret the significance of mosquito infection as it relates to occurrence of the disease. This involves careful measurement of the mosquito density and of animal and bird populations in the vicinity of mosquitoes known to possess the virus. One obvious inadequacy in accomplishing this study, which will take a number of years to make more meaningful, pertains to existing methods of mosquito population sampling. The State bureau of vector control will determine whether a more sensitive method of objective sampling is obtainable.





*A survey of sanitarian education, experience, and training, such as the questionnaire study described here, accents the administrative need for inventories of sanitation personnel.*

## A Pilot Survey of Sanitarians and Their Background

By HENRY R. O'BRIEN, M.D., M.P.H., and  
ARTHUR H. NEILL, C.E., M.P.H.

YESTERDAY, environmental health services were performed chiefly by the sanitary inspector on the one hand and the sanitary or public health engineer on the other. Today, there appears between them the modern sanitarian. While the exact duties of the modern sanitarian and his qualifications are subjects of debate, we know that since he handles complex situations he requires a broad educational background. At the same time, he does not have the training of the sanitary engineer, who is prepared to deal with the design, construction, and operation of water or disposal plants.

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*Arthur P. Miller, sanitary engineer director, Division of Sanitary Engineering Services, acted as consultant in planning the study described in this paper, which was originally presented at the 23d annual meeting of the Southern Branch of the American Public Health Association, May 11-13, 1955, New Orleans. Other papers presented at the Southern Branch meeting appear in brief in the September 1955 issue of Public Health Reports, p. 914.*

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All three, the engineer, the sanitarian, and the inspector, are concerned with matters of environmental sanitation. The dividing line between the sanitarian and the sanitary inspector is not always drawn clearly, but a distinct line is becoming visible in places. The future may see fewer of the latter and more of the former. This survey and other studies may help define our goals and shape our definitions.

This paper uses the term "sanitarian" in its broadest sense, to include the great number of those doing field work in the sanitation of the environment. We include staff members and their supervisors and omit those who hold engineering degrees, as well as laboratory workers and laborers.

The people we are considering are the second most numerous group in public health. Only public health nurses outnumber them. The contribution of sanitarians to public health progress is significant and important, for these men are in intimate and daily contact with the community's environmental needs. They may deal with only one phase of environmental health, such as milk or plumbing sanitation, or they may handle more generalized programs. They may enforce regulations or use more educational processes.

How sanitarians are being trained is therefore important even beyond the need for training all of us share in public health. Sanitarians come to the health department with

widely varied educational background and job experience. Most of them have to be trained from the beginning. It is accepted practice that in planning any inservice program of education we study such items as the trainee's age, schooling, experience, and previous practical training.

Because information on these points was lacking in the States included in Region III of the Public Health Service (Washington, D. C.), a questionnaire was prepared to secure this information for selected areas. Copies of the questionnaire were distributed to the individual sanitarians in May and June 1954, through the health department of a State (Maryland), a city (Baltimore), a large island (Puerto Rico), and a small island group (the Virgin Islands), which are all within Region III and offer some contrast with each other. If the pilot study proved worth while, it was planned to extend it to other States in Region III, and perhaps elsewhere.

In all, 491 replies were returned as follows:

<b>Maryland:</b>	
State health department.....	5
County health departments.....	68
Private industry (milk plants).....	11
<b>Total .....</b>	<b>84</b>
<b>Baltimore:</b>	
City health department:	
Industrial hygiene.....	6
Food sanitation.....	12
Housing sanitation.....	19
Meat inspection.....	18
Milk sanitation.....	12
Rodent control.....	12
General community sanitation.....	13
Plumbing inspection.....	7
<b>Health department total.....</b>	<b>99</b>
Sanitary corps (police department).....	24
Private industry:	
Grocery chains or railroad dining cars....	22
Milk plants.....	19
<b>Total .....</b>	<b>164</b>
<b>Virgin Islands .....</b>	<b>10</b>
<b>Puerto Rico:</b>	
Vector control.....	10
General sanitation:	
Supervisors .....	22
General community sanitarians.....	201
<b>Total .....</b>	<b>233</b>

The returns from official health departments apparently include all the sanitary staff. The number of sanitary workers (52) paid by private industry in the State of Maryland, including Baltimore, is probably not complete. Doubtless, there are still others in industry whose work is broadly like that of a health department sanitarian. Those of us who are in Government service might be more alert to searching them out, for we are all working in community sanitation together, and the advantages of training should be extended to sanitation personnel wherever possible.

### Analysis of the Tables

Some of the findings of the questionnaire are included in various tables and are touched on in this discussion. The samples of information included in the tables and the groupings in which they are presented illustrate some of the ways in which the returns of similar questionnaires can be studied. We caution that the data reported here are limited in scope. However, from such types of information in our own area we should be able to determine what kind of sanitary workers we are getting. Are they the kind we want? How are we training them? How do we compare with our neighbors, with ourselves some years ago? Are we moving in ways we want to go?

### *Population Ratio*

Our first interest might well be the number of sanitarians employed by health departments in relation to population. Baltimore City and Puerto Rico are much alike in this respect. In Baltimore, 1 sanitarian is employed for each 10,060 persons in the population. In Puerto Rico, the ratio is 1 to each 9,532. Maryland outside of Baltimore shows 1 sanitarian for each 20,904 persons. The Virgin Islands ratio is 1 to 2,200, but there the population is scattered over 3 islands.

### *Age, Education, and Salary*

The relation of age and level of education attained before employment is an appropriate study. Figures for Maryland appear in table 1. The table might be interpreted in this fashion: Most of the men with less than average

**Table 1. Relationship of age and education attained by Maryland sanitarians,<sup>1</sup> 1954**

Age group (years)	Second college degree <sup>2</sup>	First college degree <sup>3</sup>	High school graduation <sup>4</sup>	Some high school	8th grade or less
24 and under		1			
25-29		10	2	1	
30-34		9	3		1
35-39	3	4	4		
40-44	2	3	3	1	
45-49	1	3	2	1	
50-54		2	3	2	1
55-59	1		3	3	2
60-64		1	2		1
65-69				2	
70-74			1	1	
Not stated		2	1		2
Total number	7	35	24	11	7

<sup>1</sup> Excluding sanitarians in Baltimore. <sup>2</sup> Master's degree or doctorate. <sup>3</sup> Bachelor's degree. <sup>4</sup> But lacking college degree.

**Table 2. Educational progress of all sanitarians in areas studied, 1954**

Schooling completed	Total	Maryland	Baltimore	Virgin Islands	Puerto Rico
All sanitarians					
Total number	491	84	164	10	233
8th grade:					
Number	464	75	150	8	231
Percent of total	95	89	92	80	99
High school:					
Number	372	66	109	6	191
Percent of total	76	78	66	60	82
College:					
Number	125	42	60	0	23
Percent of total	25	50	37		10
Sanitarians with less than 4 years in present service					
Total number	172	40	51	4	77
8th grade:					
Number	169	40	48	4	77
Percent of total	98	100	94	100	100
High school:					
Number	160	35	44	4	77
Percent of total	93	83	86	100	100
College:					
Number	68	27	27	0	14
Percent of total	40	68	53		18

<sup>1</sup> The 3 sanitarians who had not finished the 8th grade were not in the health department.

schooling are in the older age groups. When these workers were in their boyhood, fewer children went on to finish high school, or even grade school. It might be that the 5 who attended only grade school and the 11 others who did not finish high school would raise problems in inservice education, though their maturity and experience will aid them.

Another grouping summarizes the educational background of sanitarians in the four areas studied (table 2). About three-fourths of the sanitarians in each area—more in Puerto Rico, fewer in Baltimore and the Virgin Islands—finished high school. Half of the Maryland workers, a third of those in Baltimore City, and a tenth of those in Puerto Rico had college degrees. None in the Virgin Islands had college degrees. And in no area had every sanitarian finished grade school.

The figures change greatly when we consider only the 172 sanitarians with less than 4 years in the present sanitation service. All health department appointees have finished the eighth grade. More than 90 percent of the new sanitarians are high school graduates, and 40 percent have college degrees. This trend is distinctly encouraging. The knowledge helps in

**Table 3. Major fields for degrees among sanitarians in Baltimore, State of Maryland, and Puerto Rico, 1954**

Major	Total	Baltimore	Maryland	Puerto Rico
		Private industry	City	
Total number of sanitarians	125	11	49	42
Biology	21	2	5	10
Chemistry	12	2	4	4
Bacteriology	3		2	1
Pharmacy	3	1	2	
Agriculture	21	2	1	13
Law	5		3	2
Education	9		2	7
Science, mathematics	10		7	1
English, philosophy, psychology, history	12		7	5
Government, sociology	2		2	
Other subjects	21	3	11	6
Not stated	6	1	3	1

fixing the level of instruction of new workers.

It is worth while to see the fields in which staff members with degrees have done their major work, as shown in table 3. The number

**Table 4. Relationship of salary and education level attained by Maryland sanitarians,<sup>1</sup> 1954**

Salary group	Second college degree <sup>2</sup>	First college degree <sup>3</sup>	High school graduation <sup>4</sup>	Some high school	8th grade or less
\$2,500-\$2,999	-----	1	1	1	2
\$3,000-\$3,499	-----	1	2	5	-----
\$3,500-\$3,999	-----	20	3	2	5
\$4,000-\$4,499	3	6	14	3	-----
\$4,500-\$4,999	1	3	3	-----	-----
\$5,000-\$5,499	1	1	1	-----	-----
\$5,500-\$5,999	1	2	-----	-----	-----
\$6,000-\$6,499	1	1	-----	-----	-----
Total number	7	35	24	11	7

<sup>1</sup> Excluding sanitarians in Baltimore. <sup>2</sup> Master's degree or doctorate. <sup>3</sup> Bachelor's degree. <sup>4</sup> But lacking college degree.

of sanitarians with major work in biology, chemistry, science, and mathematics is expected. The large number in agriculture might surprise some. But certainly law, education, English, philosophy, and history are not conventionally listed among the expected basic requirements for a sanitarian. It would be worth while for the competent administrator to ponder on the work of the individuals on his staff, as reflecting their college training, and come to his own conclusions. He may reach the opinion that nonscientific courses are better preparation for dealing with the public than scientific training or that the course itself does not matter so much as the candidate's personality, or he may return to a preference for the biological sciences.

Three tables (tables 4-6) express in various groupings the relationship of salary and education level in State, local, and private industry sanitarians. In general a greater degree of education is recognized with a higher salary. Yet other influences are at work also. The level of salaries in Puerto Rico and the Virgin Is-

**Table 5. Educational background and salaries of sanitarian groups in Maryland,<sup>1</sup> Virgin Islands, and Puerto Rico, 1954**

Education and income	Total	Maryland			Virgin Islands	Puerto Rico		
		State	County	Private industry <sup>2</sup>		Super- visors <sup>3</sup>	Insect control sanitar- ians	General sanitar- ians
Total number of sanitarians	327	5	68	11	10	22	10	201
Schooling completed								
8th grade	314	5	61	9	8	22	10	199
High school	262	5	53	8	6	22	7	161
College	65	5	32	5	-----	22	1	-----
Salary bracket								
Under \$2,000	175	-----	-----	-----	7	-----	4	164
\$2,000-\$2,499	43	-----	-----	-----	3	-----	5	35
\$2,500-\$2,999	7	-----	4	1	-----	-----	-----	2
\$3,000-\$3,499	21	-----	8	-----	-----	12	1	-----
\$3,500-\$3,999	37	1	28	1	-----	7	-----	-----
\$4,000-\$4,499	28	2	19	5	-----	2	-----	-----
\$4,500-\$4,999	7	-----	5	2	-----	-----	-----	-----
\$5,000-\$5,499	3	-----	3	-----	-----	-----	-----	-----
\$5,500-\$5,999	3	1	-----	2	-----	-----	-----	-----
\$6,000-\$6,499	2	1	1	-----	-----	-----	-----	-----
Not stated	1	-----	-----	-----	-----	1	-----	-----

<sup>1</sup> Excluding sanitarians in Baltimore. <sup>2</sup> Milk plant inspectors. <sup>3</sup> With degree of master of sanitary science.

Table 6. Educational background and salaries of sanitarian groups in Baltimore, 1954

Education and income	Total	Sanitary police	Private industry sanitarians		City health department sanitarians							
			Foods	Milk plants	Industrial hygiene	Foods	Housing	Meats	Milk	Rodent control	General sanitation	Plumbing
Total number of sanitarians-----	164	24	22	19	6	12	19	18	12	12	13	7
Schooling completed												
8th grade-----	150	17	21	17	6	12	19	18	11	10	13	6
High school-----	109	6	15	14	5	12	17	9	11	10	12	-----
College-----	60	-----	6	5	2	7	16	7	5	5	7	-----
Salary bracket												
\$2,500-\$2,999-----	2	-----	-----	1	-----	-----	1	-----	-----	-----	-----	-----
\$3,000-\$3,499-----	24	2	(1)	(1)	1	3	6	1	1	4	5	1
\$3,500-\$3,999-----	47	3	-----	-----	3	4	8	9	4	6	5	5
\$4,000-\$4,499-----	32	19	-----	-----	1	3	3	-----	2	1	3	-----
\$4,500-\$4,999-----	5	-----	-----	-----	1	-----	-----	2	-----	-----	-----	-----
\$5,000-\$5,499-----	7	-----	5	-----	-----	1	-----	1	-----	-----	-----	-----
\$5,500-\$5,999-----	7	-----	-----	-----	-----	-----	-----	3	2	1	-----	1
\$6,000-\$6,499-----	1	-----	-----	-----	-----	-----	-----	1	-----	-----	-----	-----
\$6,500-\$6,999-----	1	-----	-----	-----	-----	-----	-----	1	-----	-----	-----	-----
\$7,000-\$7,499-----	2	-----	-----	-----	-----	1	-----	-----	1	-----	-----	-----
\$7,500-\$7,999-----	1	-----	-----	-----	-----	-----	1	-----	-----	-----	-----	-----
\$8,000-\$8,499-----	1	-----	1	-----	-----	-----	-----	-----	-----	-----	-----	-----
Not stated <sup>1</sup> -----	34	-----	16	18	-----	-----	-----	-----	-----	-----	-----	-----

<sup>1</sup> Information from private industry on salaries was incomplete.

lands is lower than in the mainland areas studied. That 14 Maryland sanitarians without a degree (table 5) are in a higher salary bracket than 20 holders of a degree is usually because the college graduates have been at work a shorter time.

### *Service and Training*

Tables 7 and 8 deal with length of service with the present employer. In this field, as a rule, the length of service is identical with the years in sanitation; very few sanitarians have had previous experience in sanitation before coming to the present job.

The information in these two tables gives us some idea of turnover. It appears that one-third of the sanitarians in Maryland counties and one-fourth of those in the other areas have served their present employers less than 3 years. We can also see that the period of service in

Baltimore City varies also according to the activity—plumbing inspection has been long established in the health department, whereas housing is new. We can interpret the tables as pointing a need and opportunity for early training in order to make the workers effective as soon as possible and to prevent undesirable work habits from forming and becoming fixed.

The most detailed account of on-the-job training is available in Puerto Rico's replies to the questionnaire. Almost one-third of the sanitarian staff attends one or more short courses each year. Twenty-two sanitarians took 1-day short courses in 1951; altogether, 31 took short courses that year. Forty-two sanitarians took short courses in 1952, and 74 in 1953. Several persons attended from 3 to 6 institutes each in the years 1951 to 1953. The health department usually arranges the programs for these short courses, sometimes with outside help.

For years, a feature of training sanitarians in Puerto Rico has been a general sanitation course lasting some 90 days. A similar course is offered in many States. The training in Puerto Rico was intended for the nonsupervisory personnel but was not taken by the workers in vector control, a group of older men, or by those studying for a master's degree in sanitary science at the University of Puerto Rico. Of the 201 general sanitarians, 143 (71 percent) took the 90-day course in the years from 1937 to 1954—a remarkably good record

for this 17-year period. The ages of the 58 who have not taken such a course vary as follows:

Age group	Number	Age group	Number
25-29	5	50-54	7
30-34	7	55-59	13
35-39	3	60-64	12
40-44	4	65-69	3
45-49	4		

The health department might well consider which of these individuals could profitably take the 3 months' general course.

**Table 7. Length of sanitation service with present employer, for sanitarians in Baltimore, 1954**

Years of service	Total	Sanitary police	Private industry sanitarians		City health department sanitarians							
			Foods	Milk plants	Industrial hygiene	Foods	Housing	Meats	Milk	Rodent control	General sanitation	Plumbing
Total number of sanitarians.....	164	24	22	19	6	12	19	18	12	12	13	7
Less than 3.....	41	7	5	4	2	3	12	2	1	1	4	
3-4.....	18	3	1	3	1	1	3	1		4	1	
5-9.....	48	11	8	3	1	5	4	2	2	6	4	2
10-14.....	20	1	3	3	1	2		2	3	1	4	
15-19.....	5	1		2				2				
20-24.....	7			4				1	1			1
25-34.....	18		1		1	1		8	5			2
35 or more.....	2											2
Not stated.....	5	1	4									

**Table 8. Length of service with present employer, for sanitarians in Maryland, Puerto Rico, Virgin Islands, 1954**

Years of service	Total	Maryland			Virgin Islands	Puerto Rico		
		State	County	Private industry <sup>1</sup>		Super- visors <sup>2</sup>	Insect control sanitarians	General sanitarians
Total number of sanitarians.....	327	5	68	11	10	22	10	201
Less than 3.....	93	1	23	3	3	10		53
3-4.....	36		16		1	4		15
5-9.....	92	2	11	4	2	7	3	63
10-14.....	38	2	14	2	1	1	2	16
15-19.....	20		4				1	15
20-24.....	14			1			1	12
25-34.....	25						3	22
35 or more.....								
Not stated.....	9			1	3			5

<sup>1</sup> Milk plant sanitarians.      <sup>2</sup> With degree of master of sanitary science.

### Uses for a Sanitarian Study

For some 14 years the public health nurses concerned with staff preparation have used a questionnaire on college education and formal training in public health nursing to point out problems, to plan programs, and to measure progress from year to year.

We offer this analysis of a pilot study in an effort to spur a similar evaluation for sanitarians. All concerned—sanitarians, sanitary engineers, training officers, and health officers—need to discuss the subject and move toward some agreement on standards.

That an inventory of sanitarians is seriously needed is evident. It is important to know much more than we do about our sanitarians, who they are, where they are, whether they are employed by the community or privately. They will all be needed in a public emergency.

Some such inventory procedure would seem indispensable for any administrator responsible for the services of a group of sanitarians. Whether a questionnaire, as used in this study or after some revision, should be used or whether a personnel card containing similar data would suffice is a fair subject for consideration. The questionnaire used in this study frequently aroused staff interest, a desirable reaction. It seems evident that the information should be collected in every State and in such a uniform fashion as to permit comparison.

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*Samples of the questionnaire on sanitarian training are available from Region III, Public Health Service, Department of Health, Education, and Welfare, Washington 25, D. C.*

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### Ratio of Old-Age Assistance to Old-Age Insurance

Proportionately, 20 percent fewer people were receiving old-age assistance payments in June 1955 than in June 1950, Commissioner of Social Security Charles I. Schottland reported in November.

There were 14,244,500 persons aged 65 or older in June 1955. Old-age assistance was received by 2,544,496, or 179 of each 1,000. In June 1950, 2,786,690 of the aged population of 12,399,100, or 225 of each 1,000, were receiving old-age assistance.

One reason for this decline in the number of assistance recipients is the increase in the number of aged who now receive old-age and survivors insurance benefits. In June 1950, only 169 of each 1,000 aged persons received insurance benefits. In June 1955, 423 of each 1,000 aged received insurance benefits.

Although the caseload of aged persons drawing public assistance has dropped during the past 5 years, the cost of the program has increased because payments to individuals in most States are larger.

# Canine Leptospirosis and Public Health

By ROBERT J. BYRNE, D.V.M.

SINCE the first report of canine leptospirosis in the United States in 1937 (1), the disease has been found with increasing frequency. Today, the effective detection and treatment of canine leptospirosis must be regarded as one of the most important problems challenging the veterinary profession.

*Leptospira canicola*, the organism responsible for the canine disease, can be transmitted to man by various methods. The resultant illness is a serious one and should be considered as a public health problem of importance. The various aspects of *Lept. canicola* infections necessary to an understanding of the problem will be considered here.

## History

The first detailed description of the disease now believed to be human leptospirosis dates back to 1886 when Weil described the clinical disease syndrome which still bears his name. The disease was characterized by icterus, fever, hemorrhagic tendency, and a high mortality resulting from renal, hepatic, and vascular failure.

The search for the etiological agent of this so-called "Weil's disease" ended when Japanese

(2) and European (3) workers independently isolated a spirochete, later designated as a *Leptospira* by Noguchi (4).

The first evidence of an animal-host carrier was obtained by Miyajima in Japan, who demonstrated that spirochetes were present in the tissues of field mice (5). The significance of such leptospiral carriers was dramatically illustrated in the rat infested trenches of World War I where over a hundred cases of human leptospirosis occurred (6). Since those early reports, new leptospiral hosts have been found, including almost every type of domestic animal, most rodents, and many wild animals. In addition to *Leptospira icterohemorrhagiae*, numerous other leptospiral serotypes pathogenic for animals and man have been identified and differentiated from each other by serologic techniques.

In 1931, Klarenbeek and Schuffner, in the Netherlands, isolated leptospires from the urine of a dog affected with nephritis (7). The leptospiral strain was found to differ serologically from *Lept. icterohemorrhagiae* and was designated as *Lept. canicola*. Shortly thereafter the first human infection with *Lept. canicola* was reported in that country (8). This leptospiral serotype was isolated from dogs in the United States by Meyer and associates in 1937 (9), and the first human case in this country was reported in 1938 (10).

## Etiology

Members of the genus *Leptospira* are delicate filamentous organisms, tightly coiled, and usu-

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*Dr. Byrne is with the Grayson Research Laboratory, University of Maryland, at College Park. This address was delivered at Pennsylvania's Third Annual Health Conference in August 1954. At that time, Dr. Byrne was with the Army Medical Service Graduate School, Washington, D. C.*

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ally hooked at both ends. They are generally 6 to 14 microns in length, but individual organisms measuring up to 40 microns have been observed in laboratory cultures. They are difficult to stain and cannot be observed in the living state except by darkfield or phase-contrast microscopy. These spirochetes can be propagated in special laboratory media in which they may remain viable for a year or longer. Viability, as well as pathogenicity for certain animal hosts, may be maintained by serial passage in hamsters of infective blood or tissues. Since one leptospiral species cannot be differentiated from another by morphologic, cultural, or biochemical methods, classification is based on serologic methods involving cross-agglutination and absorption techniques.

### Epidemiology

The widespread distribution of canine leptospirosis in the United States has been substantiated by numerous epidemiological surveys. The reported incidence has varied from 3 to 38 percent depending on the diagnostic technique used and the age of the dogs surveyed (11-13). Man and other susceptible hosts can become infected by direct contact with contaminated urine from infected dogs, by consumption of food or water so contaminated, or by close contact with surface water in which pathogenic leptospires are present. Infection can occur by entry of these organisms through a skin abrasion or cut, or through the unbroken mucosal surfaces of the conjunctiva, pharynx, or nasal passages.

Pathogenic leptospires are harbored in the kidneys of rodents and other mammalian hosts. These organisms display a characteristic affinity for the renal cortex where they may be found nesting in the lumina of the convoluted tubules. From these foci they may be excreted in the urine for long periods of time. Should such organisms find their way into a favorable environment—such as damp soil or a small body of fresh water—they may survive for as long as 22 days (14). Dr. D. W. Johnson of Australia in a personal communication reports survival of the organisms for as long as 7 weeks.

The possibility of transmitting this disease from dog to man is readily apparent. Dog

handlers, kennelmen, and veterinarians are most subject to infection from exposure to contaminated urine. Cuts, abrasions, or scratches of the hands provide suitable routes of entry for these organisms. The fact that in many instances a dog's urine may be acidic is no assurance that infections cannot be acquired in this manner. Despite the preference of leptospires for an environment having pH values ranging from 6.8 to 8.6, these organisms are able to survive for short intervals in acidic urine, and upon invading a new susceptible host could multiply and produce disease.

Human *Lept. canicola* infections associated with swimming or wading in surface waters contaminated with dog urine have been reported (15). Of possibly greater epidemiological significance is the transmission of *Lept. canicola* infections from dogs to larger domestic animals and subsequent development of leptospirosis in these new hosts. The relatively large volume of infected urine excreted by these animals, cows and swine, for example, poses a far greater threat in the contamination of surface water than that excreted from dogs (16).

A constant reservoir of infection is maintained in the kidneys of the many urinary shedders among the canine population. This factor, coupled with the characteristic greeting behavior of dogs, insures the sustenance of *Lept. canicola*. Presumably, *Lept. icterohemorrhagiae* infections in dogs are contracted in this manner or when dogs kill and eat infected rats or other rodents.

The dog has been proved a host to several distinct leptospiral strains, some of which have yet to be reported in the United States. *Lept. canicola* has been universally incriminated as the most frequent leptospiral parasite of dogs, although occasional cases of *Lept. icterohemorrhagiae* infections have been reported. In the United States, serologic evidence indicates that about 90 percent of all canine leptospirosis involves *Lept. canicola* and 10 percent are probably due to *Lept. icterohemorrhagiae* (17).

Other leptospiral strains which have been reported in dogs are *Lept. pomona*, the principal causative agent of bovine and porcine leptospirosis in the United States; *Lept. hebdomadis* and *Lept. autumnalis*, the latter two serotypes being found most frequently throughout the Far

East. *Lept. australis* A., *Lept. medanensis*, *Lept. bataviae*, *Lept. grippotyphosa*, and *Lept. sejroe* have all either been isolated from dogs or there is serologic evidence suggesting their existence in this host. The importation of dogs from many parts of the world carries with it the possibility that new leptospiral strains may be introduced in the United States, thus presenting new disease problems among both animals and man.

### Clinical Aspects in Animals

Added to the other pathogenically unique effects which characterize leptospirosis are the particular syndromata produced by this disease in dogs. Based on experimental evidence and field observations, it is impossible to predict consistently the precise clinical response to leptospiral infection. Reactions following inoculations with living leptospirae are variable—a dog may remain completely asymptomatic, or become jaundiced, develop a renal syndrome, or suffer a peracute fulminating disease resulting in death.

Acute canine leptospirosis resulting in either a severe icteric or hemorrhagic disease has been

reported in epizootic proportions (9). The disease may appear in kennels and result in a high fatality rate, particularly among young dogs. These outbreaks are characterized by the high incidence of jaundice in affected animals from which the common designation, "canine yellows," has been derived.

An animal surviving the acute disease or experiencing a mild subclinical infection almost invariably becomes a urinary carrier. The apparent effect of the extended nesting of leptospirae in the kidney tubules of dogs is a tissue response manifested finally by the development of interstitial nephritis. Should this process continue over a prolonged period of time, severe renal dysfunction may result with the development of a uremic syndrome known as "canine typhus" or "Stuttgart disease."

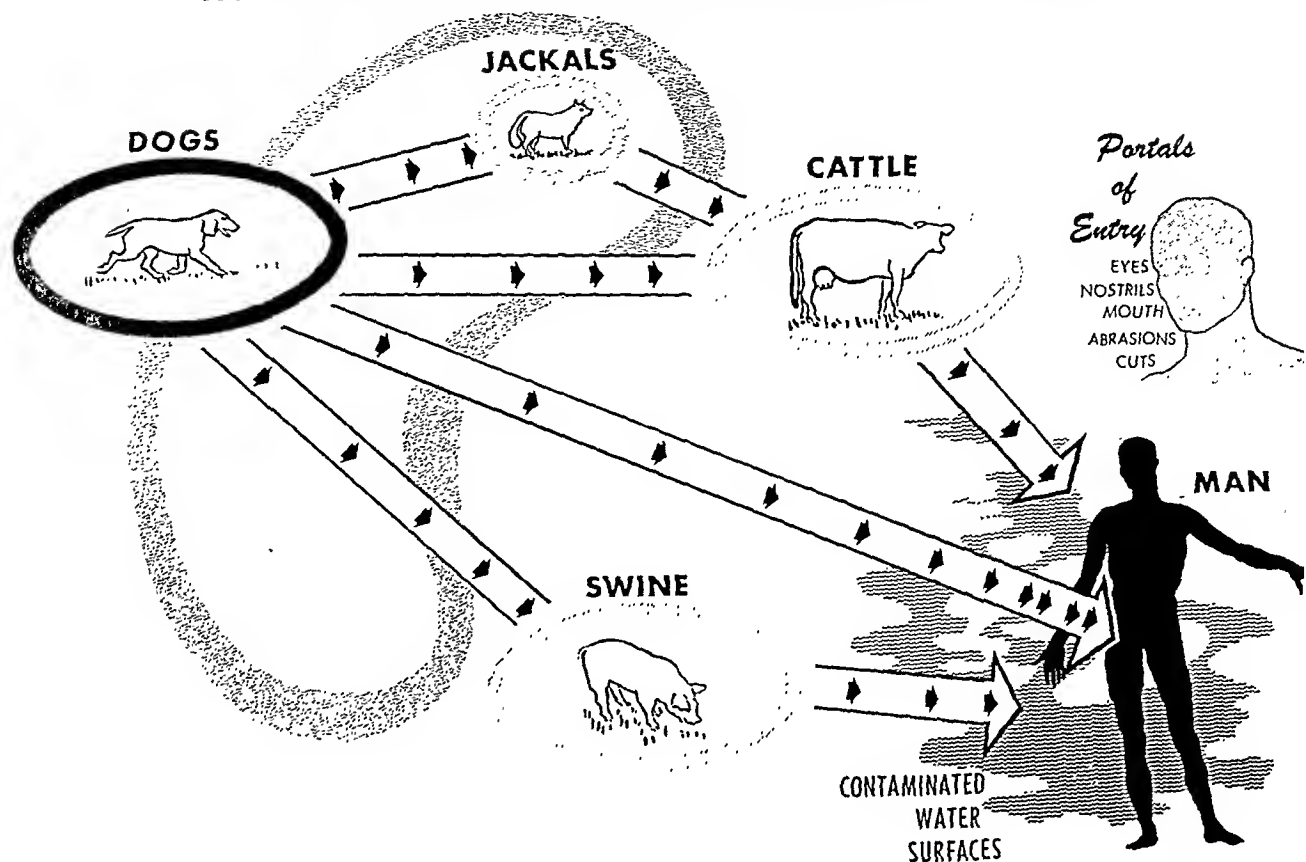
Numerous attempts have been made to outline the symptomatology of canine leptospirosis and to define and describe various forms in which the disease may manifest itself. These descriptions usually include a hemorrhagic type and a uremic type. Bloom (18) comments: "The clinical manifestations of canine leptospirosis are extremely variable and may be absent, latent, subclinical, atypical, mild or

***Leptospira canicola***  
magnified about  
27,000X.



Photograph by Dr. Edgar Ribi, PHS,  
Rocky Mountain Laboratory, Hamilton,  
Mont.

## Transmission of canine leptospirosis to animals and man.



severe. The clinically obvious disease may be peracute, acute, subacute, or chronic."

It would be equally accurate to describe the clinical disease from the bacteriological and pathological standpoint. This has been done by Stuart (19), who mentions three stages:

*Invasive.* After gaining entry, the leptospires multiply and find their way to all organs of the body. Direct isolations from the blood may be made at this time. This is the period of febrile illness and is generally accompanied by lethargy and anorexia. Jaundice, if it occurs at all, usually appears immediately at the end of this period. Serum titers do not usually reach significant levels at this stage.

*Primary renal.* The invasive stage may be followed a week later by a primary nephritic stage, which may be the first stage to be clinically detected. During this period leptospires have found their way to the kidney tubules, whereupon the spirochetes may be isolated from the urine. A diffuse or focal round-cell infiltration characterizes the interstitial nephritis that results from the kidney infection. The

uremia which commonly occurs from this stage may result from nephron obstruction or other pathological changes, not clearly understood. Apathy, stomatitis, and thirst are the chief clinical symptoms manifested by affected animals. The blood-urea nitrogen level is generally elevated, and the leptospiral agglutination titers of the serum reach a high level.

*Secondary renal.* The primary nephritic stage may proceed, after a lapse of several months or years, into a secondary nephritic stage. This stage is characterized pathologically by chronic interstitial nephritis accompanied by fibrosis and clinically by uremia. Leptospiruria is rarely found, and it must be concluded that the kidney damage is not associated with a continuing infection. The serum agglutination titers tend to be of a low order during this stage.

### Clinical Aspects in Humans

The basis for naming the human leptospirosis diseases has included such considerations as g

graphic location or epidemiological and clinical similarities associated with infections by specific leptospiral strains or serotypes. For example, Weil's disease is associated with *Lept. icterohemorrhagiae* infections, and *Lept. grippotyphosa* is the etiological agent of mud fever. In Japan, akiyami, or autumn sickness, is caused by *Lept. autumnalis*. *Lept. canicola* infections in man have been described as canicola fever. Within some of these groupings extreme variations in the clinical manifestations are frequently found. The protean nature of the human leptospire is exemplified by the various symptoms of *Lept. canicola* infections.

As with other leptospiral infections, the onset of canicola fever is quite sudden and characterized by chills and fever, severe headache, stiff neck, and intense muscular pains.

In general, it is a relatively mild disease, but on occasions it may simulate classical Weil's disease and result in death. A grippelike form of canicola fever has been described in which such respiratory symptoms as cough and bronchitis are observed. Ocular manifestations in the form of uveitis may occur long after the febrile stage of this disease has passed (20).

The ease with which leptospiral infections can mimic other diseases was demonstrated in an outbreak affecting 25 children in Georgia (16). These children went swimming in a small stream which was polluted with the urine of cows and pigs upstream and developed a disease initially diagnosed as dengue. It was not until the epidemiological and laboratory aspects of the outbreak were completed that *Lept. canicola* was established as the etiological agent.

Rosenberg (21), in his review article, states that approximately 50 percent of all cases of canicola fever are accompanied by meningeal symptoms. A study by Beeson and Hankey (22) indicated that 8 to 10 percent of all cases of aseptic meningitis are leptospiral in origin, and half of that number were canicola infections. This figure agrees closely with data obtained by other American and European investigators. Reference has been made to the resemblance of leptospiral meningitis to early poliomyelitis (23). Woodward (24) points out that leptospirosis must be considered in the differential diagnosis in any disease in which lymphocytes are found in the spinal fluid—

such as lymphocytic choriomeningitis, mumps, herpes, poliomyelitis, Cocksackie disease and the various neurotropic encephalitides.

### Laboratory Diagnosis

The reported incidence of leptospirosis often varies with the awareness of the disease. To confirm a diagnosis of leptospirosis in either man or animals, adequate laboratory support is essential. At present, this type of support is not always available. There are relatively few laboratories in the United States which have the necessary equipment and trained personnel essential to carry out this task. The laboratory diagnosis of leptospirosis is based either on the demonstration of the organism in the blood, cerebrospinal fluid, or urine during the course of disease, or by a rise in antibody titer between serum specimens taken during acute and convalescent phases, or by pathological findings at autopsy.

Leptospire appear regularly in the circulating blood during the first week of disease and may be isolated at this time by directly inoculating a few drops of blood into appropriate laboratory media. These cultures are subsequently examined at 2-week intervals by dark-field microscopy. If no leptospire can be demonstrated in the media after 28 days, cultures may be discarded as negative. Such techniques may also be employed in isolating leptospire from cerebrospinal fluid during the early stages of infection. It is difficult and often dangerous to base a diagnosis of leptospirosis on the direct darkfield examination of blood. The presence of artifacts in the form of fibrin shreds or other blood constituents may lead to a false diagnosis. Conversely, leptospire are ordinarily present in such small numbers as to be missed by direct examination.

The leptospiruric phase of the disease usually commences about 12 to 14 days after the onset of symptoms. The same precautions must be applied to the direct darkfield examination of urine as were cited regarding blood, although on occasions, large numbers of leptospire have been directly observed in the urine of dogs and other animals.

Attempts to isolate these spirochetes from urine are best made by inoculating freshly

voided or catheterized urine samples intraperitoneally into young guinea pigs or hamsters, bleeding these animals by cardiac puncture 4 to 6 days after inoculation and culturing media with their blood. These cultures are then handled in the same manner as those initiated directly from the patient's blood. Cultivation of leptospires directly from urine is usually not feasible, because of bacterial contaminants.

Serologic diagnosis is based on the demonstration of a rise in antibody titer between serum specimens drawn during the acute phase of disease and during convalescence. In the laboratory at the Army Medical Service Graduate School, a modification of the Schuffner-Mochtar agglutination-lysis test employing a battery of viable leptospiral type strains is used (25). In making a serologic diagnosis of leptospirosis, the value of paired serum specimens cannot be stressed too strongly. Single serum specimens, particularly those with a low antibody titer, are often of little value unless accompanied by a complete clinical history. A low serum titer may indicate a past leptospiral infection or a new infection in the early stage of antibody development.

Complement fixation has been employed in the diagnosis of human leptospirosis infection (26). Although it has proved of value in the diagnosis of leptospirosis per se, it is not sufficiently specific to give any clue as to the infecting strain or serotype. To date at our laboratory, this test has been of little value in the diagnosis of canine leptospirosis due to the occurrence of nonspecific reactions between antigens and the majority of canine serums.

The use of various types of macroscopic agglutination antigens in the serologic diagnosis of leptospirosis has been cited on numerous occasions. Although tests employing such antigens have had advantages in the ease and rapidity of performance, they are generally less sensitive than microscopic tests, and often the antigens have been found to be unstable. Recently a capillary-tube test for the diagnosis of leptospirosis was described by Stoenner (27).

### Therapy

An effective course of treating human leptospirosis still remains a conspicuously unsolved

problem. Hall and associates (28), in a study of 67 laboratory confirmed cases, concluded that none of the antibiotics employed in their study altered the course of disease or affected the duration of leptospiremia. Other workers (29) obtained similar results in dogs, hamsters, and guinea pigs when evaluating chloramphenicol, subtilin, and penicillin G. Gsell (30), however, reports favorable response in human leptospirosis to either aureomycin or terramycin if initiated on the first or second day of disease. Brunner and Meyer have reported that streptomycin (31) or aureomycin (32) given in adequate dosage will eliminate the carrier state in dogs and hamsters. These investigators suggest the administration of either of these antibiotics to dogs whenever there is a question of an animal being a carrier and transmitting the disease to other animals or man.

### Control

The ultimate control of human canicola fever is based on the control of the animal leptospires. To achieve this end and to break the chain of infection that perpetuates the disease, it is essential that a vaccine for the prevention of canine leptospirosis be developed and made available for widespread distribution and use. Such a vaccine, of necessity, should meet the following requirements:

1. Elicit the production in the recipient of protective antibodies which will persist over a reasonable period of time, while at the same time insure that the vaccinated animals will not develop either clinical symptoms or leptospiruria subsequent to challenge. Bacteriological studies on both vaccinated animals and controls must be carried out to determine the degree of protection attained.

2. Exhibit minimal toxicity following administration.

3. Be polyvalent and give adequate protection against both *Lept. icterohemorrhagiae* and *Lept. canicola* in the United States. In certain other countries, additional leptospiral strains would have to be incorporated in such a vaccine.

Until canine leptospirosis is controlled, a large reservoir of infection remains among the dog population. The owners of these animals must be educated to this fact and to the danger

of acquiring canicola fever from close association with dogs.

## Conclusions

Canine leptospirosis is widespread, and its control is a growing problem to the veterinary profession. Certain fundamental questions regarding epidemiological, clinical, pathological, and immunological characteristics of canine leptospirosis remain unanswered. Practicing veterinarians can do much to alleviate this situation by recording and reporting clinical cases of canine leptospirosis, particularly in those instances in which laboratory support has been made available.

Research activities must be directed toward the development of improved diagnostic techniques, further evaluation of therapeutic agents in the treatment of clinical leptospirosis, and development of adequate vaccines for the protection of man and animals.

The extent of human leptospirosis acquired from dogs remains undetermined. Education of the public to the danger of acquiring the disease, the development of adequate diagnostic laboratory facilities, and a constant awareness of the protean nature of the disease are the best means of bringing the problem into proper perspective.

## REFERENCES

- (1) Jungherr, E.: Observations on canine spirochetosis in Connecticut. *J. Am. Vet. M. A.* 91: 661-673 (1937).
- (2) Inada, R., Ido, Y., Koki, R., Kaneko, R., and Ito, H.: The etiology, mode of infection and specific therapy of Weil's disease. *J. Exper. Med. & Hyg.* 23: 377 (1916).
- (3) Uhlenhuth, P., and Fromme, W.: Experimentelle untersuchungen über die sogenannte Weil'sche Krankheit (Ansteckende Gelbsucht). *Med. Klin.* 11: 1202-1203 (1915).
- (4) Van Thiel, P. H.: The Leptospiroses. Leiden, Universitaire Pers Leiden, 1948, pp. 5-6.
- (5) League of Nations: Bulletin of the Health Organization 8: 303 (1939).
- (6) Stokes, A., Ryle, J. A., and Tyler, W. H.: Weil's disease (*Spirochaetosis icterohemorrhagica*) in the British Army in Flanders. *Lancet* 1: 142-153 (1917).
- (7) Klarenbeek, A., and Schuffner, W. A. P.: Appearance in Holland of leptospira differing from Weil strain. *Nederl. tijdschr. v. geneesk.* 77: 4271-4276 (1933).
- (8) Schuffner, W. A. P.: Recent work on leptospirosis. *Tr. Roy. Soc. Trop. Med. & Hyg.* 28: 7 (1934).
- (9) Meyer, K. F., Eddie, B., and Stewart-Anderson, B.: Canine, murine and human leptospirosis in California. *Proc. Soc. Exper. Biol. & Med.* 38: 17 (1938).
- (10) Meyer, K. F., Stewart-Anderson, B., and Eddie, B.: Canicola fever—A professional hazard. *J. Am. Vet. M. A.* 44: 332 (1938).
- (11) Raven, C.: Canine leptospirosis in Pennsylvania. *J. Infect. Dis.* 69: 131-137 (1941).
- (12) Alicata, J. E., and Breaks, V.: Incidence of leptospirosis among dogs in Honolulu as determined by serological agglutination tests. *J. Washington Acad. of Sc.* 32: 305-308 (1942).
- (13) Jones, T. C., Roby, T. O., Davis, C. L., and Maurer, F. D.: Control of leptospirosis in war dogs. *Am. J. Vet. Res.* 6: 120-128 (1945).
- (14) Van Thiel, P. H.: The Leptospiroses. Leiden, Universitaire Pers Leiden, 1948, p. 56.
- (15) Mackay, D. J., and Watts, R. W. E.: Canicola fever in Germany; report of six cases. *Lancet* 1: 907-910 (1949).
- (16) Williams, H. R., Ward, M. K., McCroan, J. E., and Starr, L. E.: A water-borne outbreak of canicola fever. *Clin. Res. Proc.* 1: 97-98 (1953).
- (17) Meyer, K. F., Stewart-Anderson, B., and Eddie, B.: Canine leptospirosis in the United States. *J. Am. Vet. M. A.* 95: 710-729 (1939).
- (18) Bloom, F.: Canine leptospirosis. Symposium on the leptospiroses. Army Medical Service Graduate School Medical Science Publication No. 1. Washington, D. C., U. S. Government Printing Office, 1953, pp. 118-123.
- (19) Stuart, R. D.: Leptospirosis in dogs and other animals. *Canad. J. Comp. Med. & Vet. Sc.* 16: 257-259 (1952).
- (20) Alexander, A., Baer, A., Fair, J. R., Gochenour, W. S., Jr., King, J. H., Jr., and Yager, R. H.: Leptospiral uveitis. *Arch. Ophthalm.* 48: 292-297 (1952).
- (21) Rosenberg, B. L.: Canicola fever; review, with report of two new cases. *Am. J. Med.* 11: 75-91 (1951).
- (22) Beeson, P. B., and Hankey, D. C.: Leptospiral meningitis. *Arch. Int. Med.* 89: 575-583 (1952).
- (23) Beeson, P. B.: Benign aseptic meningitis as a manifestation of leptospiral infection. *Tr. A. Am. Physicians* 63: 130-135 (1950).
- (24) Woodward, T.: The protean manifestations of leptospirosis. Symposium on the leptospiroses. Army Medical Service Graduate School Medical Science Publication No. 1, Washington, D. C., U. S. Government Printing Office, 1953, pp. 57-67.
- (25) Gochenour, W. S., Jr., Yager, R. H., Wetmore, P. W., and Hightower, J. A.: Laboratory diagnosis of leptospirosis. *Am. J. Pub. Health* 43: 405-410 (1953).

- (26) Yager, R. H., Gochenour, W. S., Jr., Warner, A. R., Wetmore, P. W., and Hall, H.: Complement fixation in the diagnosis of human leptospirosis. *Federation Proc.* 10: part 1, 1951.
- (27) Stoenner, H. G.: A capillary-tube test for leptospirosis. *Am. J. Hyg.* 57: 316-327 (1953).
- (28) Hall, H. E., Hightower, J. A., Diaz Rivera, R., Byrne, R. J., Smadel, J. E., and Woodward, T. E.: Evaluation of antibiotic therapy in human leptospirosis. *Ann. Int. Med.* 35: 981-998 (1951).
- (29) Dunn, M. C., and Thompson, P. E.: Chemotherapy of experimental leptospirosis with chloramphenicol (chloromycetin), subtilin and penicillin G. *J. Infect. Dis.* 92: 33-39 (1953).
- (30) Gsell, O.: Discussion of J. E. Smadel's paper, "The therapy of leptospirosis." in the Symposium on the Leptospiruses. Army Medical Service Graduate School Medical Science Publication No. 1, Washington, D. C., U. S. Government Printing Office, 1953, pp. 212-219.
- (31) Brunner, K. T., and Meyer, K. F.: Streptomycin in the treatment of *Leptospira* carriers. Experiments with hamsters and dogs. *Proc. Soc. Exper. Biol. & Med.* 70: 450-452 (1949).
- (32) Brunner, K. T., and Meyer, K. F.: Effect of aureomycin on *L. canicola* and *L. ieterohemorhagiae* in vitro and experimental carrier studies. *Am. J. Vet. Research* 11: 89-90 (1950).

## Warning on Salicylate Drug Labels

The Food and Drug Administration has asked drug manufacturers to label aspirin and other salicylate drugs with a warning to keep these products out of reach of children.

Accidental misuse of salicylate preparations prompted the new ruling. Although salicylates ordinarily are not toxic in amounts required for producing analgesic action, they can cause injury or death when taken in excessive quantities. Poisoning by salicylate preparations are responsible for about 100 deaths a year, mainly in children under 5 years of age.

Recommended statements on the labels are: "Warning—Keep out of reach of children" or "Warning—Keep this and all medications out of the reach of children."

In lieu of specific dose recommendations for children under 3 years of age, FDA recommends the statement: "For children under 3 years of age, consult your physician."

The ruling does not apply to oil of wintergreen (methyl salicylate), which already bears a warning statement; effervescent salicylate preparations (those that "fizz" when placed in water); or preparations of para-aminosalicylic acid and its salts, which are used only in the treatment of tuberculosis.

The advisory ruling, published in the *Federal Register* on October 15, 1955, is based on the recommendation of the FDA medical advisory panel consisting of pediatric experts and drug industry representatives. Six months are allowed for modifying present labeling.



# Location of Dentists in Relation to Dental School Attended

By WALTER J. PELTON, D.D.S., M.S.P.H., ELLIOTT H. PENNELL, B.S.,  
and MARYLAND Y. PENNELL, M.Sc.Hyg.

DENTISTS in the United States tend to establish their practice within the area where they received their training. Data from the 1953 American Dental Directory (1) have been used to analyze the relationship between each dentist's location in 1952 and the location of the dental school in which he received his training. The directory listing usually identifies the city or town where the dentist is located, the year he was graduated, and the name of the dental school under the title which applied at the time he was in attendance.

In mid-1952 there were 84,214 dentists located in the 48 States and the District of Columbia, excluding the 7,423 dentists in the Federal services. As would be expected, most of the dentists were trained in schools located within the continental United States. A total of 78,025 dentists were graduates of active or formerly active schools located in 25 States and the District of Columbia; 490 were graduated from foreign dental schools, and 5,699 were listed in the directory without specifying the dental school from which they received their degree.

Each geographic division of the country draws the majority of its dentists from graduates of schools located within its borders, with the exception of the Mountain States (table 1).

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The most striking examples of this pattern are represented by the East and West North Central groups of States where nearly 9 out of 10 of the dentists attended school in the geographic division in which they were located in 1952 (fig. 1). In four other divisions—Middle Atlantic, South Atlantic, East South Central, and West South Central—where the proportion of dentists trained within the area was not quite so high, the rest of the dentists were drawn from schools located in one or another of the adjoining geographic divisions.

A wider spread, however, is found in two other divisions. In New England, for example, where 56 percent of the dentists were trained locally, 18 percent had attended a dental school in one of the South Atlantic States, and 16 percent came from a school in the Middle Atlantic area. While 76 percent of the dentists in the Pacific area were trained there, the others were mainly drawn from schools in the North Central States.

The pattern for the Mountain States is exceptional because they have lacked dental training facilities for the past 20 years or more. Only 18 percent of the dentists in this area were trained locally; another 18 percent came from States in the Pacific division. Approximately 32 and 25 percent, respectively, were drawn from schools in the West and East North Central States.

## Dentists Trained Within State

Missouri and Pennsylvania each had more than 90 percent of their dentists trained within



their borders. In 13 other States and the District of Columbia, three-fourths or more of the non-Federal dentists received their training in the State where they were located in 1952. In 6 additional States, local schools supplied between one-half and three-fourths of all the dentists, while in 4 other States the proportion varied from 1 to 46 percent. None of the dentists practicing in the remaining 23 States were graduates of dental schools within the State. More detailed information on where the dentists practicing in each State received their training and the reverse of the picture—the location in 1952 of the dentists trained in each of the 26 States with dental schools—is given in the Health Manpower Source Book series (2).

In New England, Massachusetts is the only State with a dental school. More than half of the dentists in Maine and New Hampshire as well as three-fourths of those in Massachusetts were trained in the latter State. Vermont, Rhode Island, and Connecticut were less dependent upon the Massachusetts schools; they also drew sizable proportions of their dentist manpower from the training facilities in Maryland and Pennsylvania.

The Middle Atlantic division has 6 active dental schools, 3 each in New York and Pennsylvania. A former dental school in New Jersey has been closed for 30 years. Two-thirds

or more of the dentists in New York and Pennsylvania were supplied from the schools within their respective boundaries. Almost the same proportion of the New Jersey dentists received their training in these same two States.

All 5 East North Central States have active dental schools. For Ohio, active dental schools at Ohio State and Western Reserve Universities and schools which are now extinct have trained more than three-fourths of the dentists located in that State. In like manner, Indiana University is the principal source of the Indiana dentists. Loyola, Northwestern, and the University of Illinois trained 81 percent of the Illinois dentists; Detroit and Michigan Universities were the source of 77 percent of the Michigan dentists; and Marquette University supplied 74 percent of the Wisconsin dentists.

Active dental schools in 4 of the 7 West North Central States supplied from 78 to 91 percent of the dentists in their respective States—Minnesota, Iowa, Missouri, and Nebraska. North Dakota drew its dentists largely from schools in Minnesota and Illinois in the East North Central division; South Dakota's dentists came mainly from schools in Nebraska and Illinois. Missouri schools trained 83 percent of the dentists in Kansas.

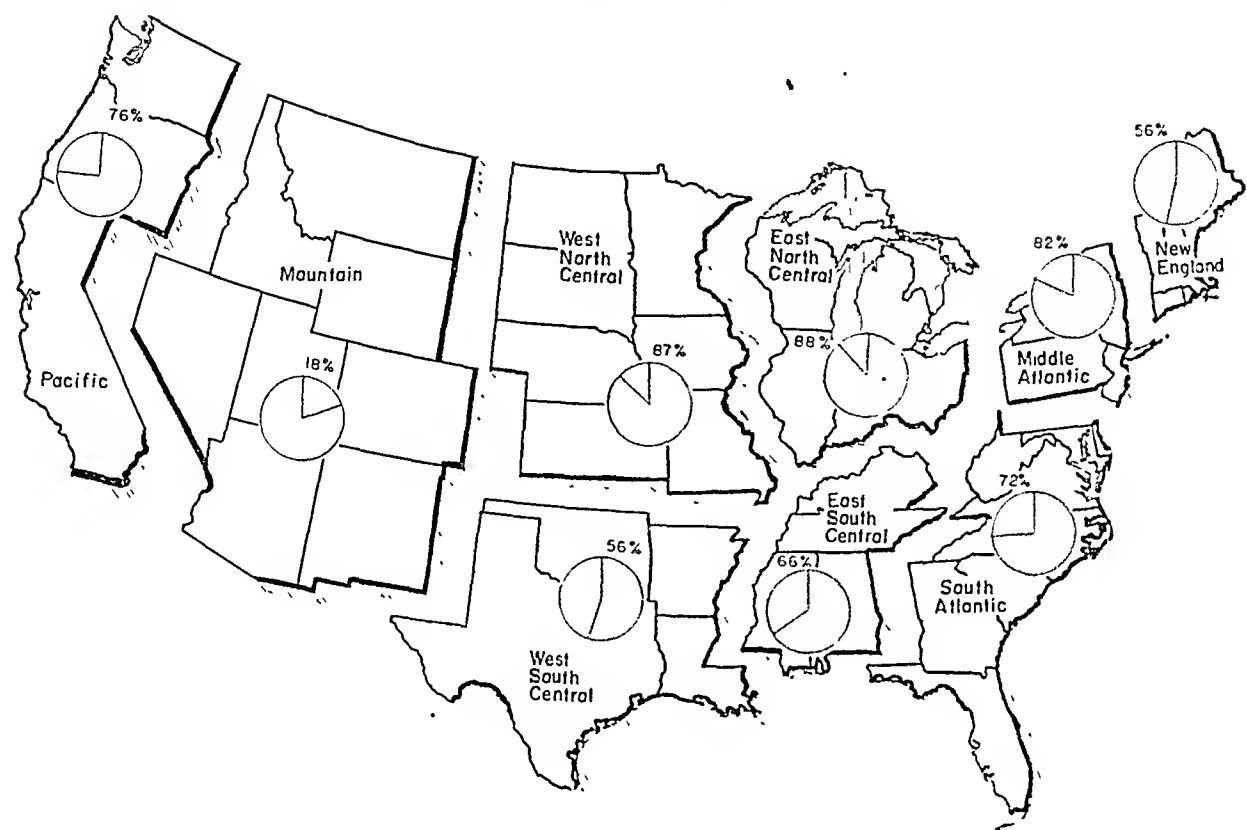
In the South Atlantic division, Maryland, Virginia, Georgia, and the District of Columbia have dental schools that graduated a class in 1952. These schools supplied from 62 to 86 percent of the dentists in their respective States, as well as the majority of the dentists in North and South Carolina. (The University of North Carolina graduated its first class in 1954, and hence is not included in this study.) Delaware drew nearly two-thirds of its dentists from schools in Pennsylvania. West Virginia had almost equal numbers from dental schools in Maryland, Ohio, and Pennsylvania. Florida had one-third of its dentists from Georgia, with sizable numbers of graduates from schools in Illinois, Pennsylvania, and Tennessee.

In the East South Central area, both Kentucky and Tennessee had 78 percent of their dentists graduated from schools in their own States. Alabama, with a school that graduated its first class in 1952, drew about two-thirds of its dentists from dental schools in Georgia and Tennessee. Mississippi depends upon

**Table 1. Non-Federal dentists located in 1952 in the same geographic division in which they attended dental school**

Geographic division	Non-Federal dentists in area		
	Total number	Trained in dental school in same area	
		Number	Per cent
United States.....	78, 025	59, 757	77
New England.....	5, 485	3, 073	56
Middle Atlantic.....	20, 922	17, 174	82
East North Central.....	17, 296	15, 251	88
West North Central.....	8, 442	7, 352	87
South Atlantic.....	6, 686	4, 840	72
East South Central.....	3, 127	2, 052	66
West South Central.....	4, 431	2, 494	56
Mountain.....	2, 279	408	18
Pacific.....	9, 307	7, 113	76

Figure 1. Dentists in the nine geographic divisions who were graduated from a dental school in that same division.



schools in these same two States to supply its dentist manpower.

The West South Central States have active dental schools in Louisiana and Texas that supplied 73 and 67 percent of their dentists, respectively. Oklahoma is largely dependent on graduates from dental schools in Missouri; Arkansas mainly depends on schools in Missouri and Tennessee.

The Mountain States have no currently active school, although nearly half of the dentists in Colorado were trained at the Denver schools closed many years ago. The Illinois schools led in supplying the largest number of dental school graduates to Montana and Utah. Missouri graduates ranked first in Wyoming and New Mexico; California graduates, in Arizona and Nevada.

All Pacific States now have active dental schools, since the University of Washington graduated its first class in 1950. The three California schools trained three-fourths of the local dentists. The University of Oregon, in

addition to supplying its own State, furnished more than half of the dentists in neighboring Washington.

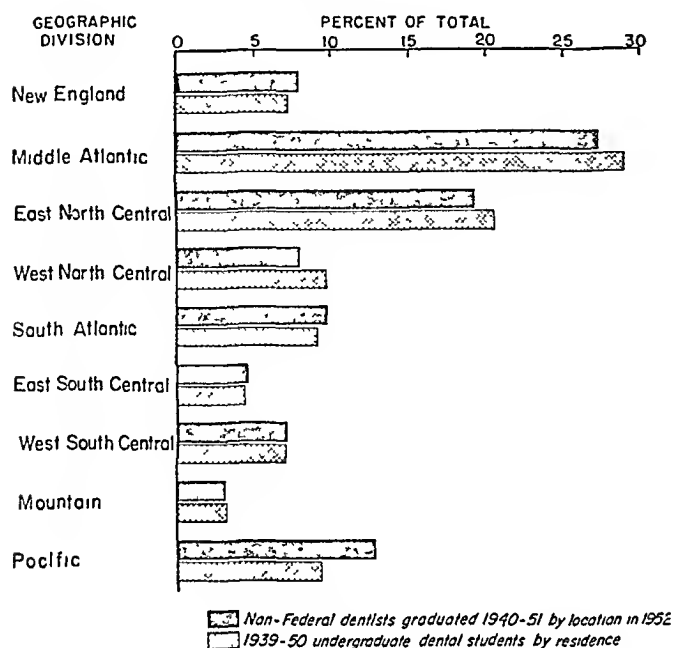
**Residence of Dental Students**

It has been shown that 1 out of 4 dentists listed in the 1953 directory received his professional training at a dental school located outside of the geographic area in which he later established his practice. Doubtless many of these dentists left their home State to attend dental school with the intention of returning home to set up practice. While data are not available for direct comparisons that would reveal the extent of this return, some deductions can be drawn from the distribution of undergraduate dental students published annually in the Dental Students' Register (3).

The proportion of undergraduate dental students in each geographic area is closely related to the proportion of graduates who subsequently established dental practice within the

same geographic area. In figure 2 the distribution by location in 1952 of the non-Federal dentists who were graduated in recent years

**Figure 2. Distribution of dentists and dental students.**



(1940-51) is contrasted with the distribution by residence of students attending dental school in the 12 academic years 1939-40 to 1950-51.

Among the nine geographic divisions, the Pacific States show the greatest relative difference in the length of the two bars. Nearly 1 dentist in 8 who established practice in the United States in recent years was located in 1 of these 3 States in 1952. On the other hand, only 1 in 10 students trained during the 12-year period was drawn from that area. In other words this area acquired a share of recent graduates that was more than one-third in excess of that expected on the basis of its contribution to the pool of students.

In terms of actual numbers, the Pacific States gained about 700 dentists over and above their share of students (table 2). The influx was chiefly into California. Since 1940 the population growth in the Pacific States has been so great that even this gain in dentists was insufficient to maintain the 1940 dentist-population ratio.

The migration to the west coast was largely among former residents of the Middle Atlantic

**Table 2. Distribution in 1952 of dentists graduated during 1940-51 from United States dental schools and distribution of undergraduate dental students, 1939-50, according to residence at time of entering dental school**

Geographic division	Non-Federal dentists graduated 1940-51 by location in 1952		1939-50 dental students according to residence		Prorated share of students	Gain or loss between number of new dentists and share of students	
	Number	Percent	Number	Percent	Number	Number	Percent
United States.....	<sup>1</sup> 19, 774	100. 0	<sup>2</sup> 24, 494	100. 0	<sup>3</sup> 19, 774	-----	-----
New England.....	1, 556	7. 9	1, 794	7. 3	1, 448	+108	+7. 5
Middle Atlantic.....	5, 397	27. 3	7, 069	28. 9	5, 707	-310	-5. 4
East North Central.....	3, 820	19. 3	5, 042	20. 6	4, 070	-250	-6. 1
West North Central.....	1, 562	7. 9	2, 377	9. 7	1, 919	-357	-18. 6
South Atlantic.....	1, 933	9. 8	2, 261	9. 2	1, 826	+107	+5. 9
East South Central.....	911	4. 6	1, 103	4. 5	890	+21	+2. 4
West South Central.....	1, 411	7. 1	1, 739	7. 1	1, 404	+7	+5
Mountain.....	629	3. 2	811	3. 3	655	-26	-4. 0
Pacific.....	2, 555	12. 9	2, 298	9. 4	1, 855	+700	+37. 7

<sup>1</sup> Excludes 6,558 graduates in the classes of 1940-51, of whom 4,787 were in the Federal service in 1952 and the remainder were located outside the United States or were dead.

<sup>2</sup> Total of the undergraduate students in United States dental schools in the fall of 1939, 1943, and 1947, excluding 788 students with residence outside the continental United States (3). This figure corresponds to the 1910-51 graduates after allowance is made for those who were not graduated. However, it may not include all students under accelerated programs—those not listed in the three issues of the Dental Students' Register.

<sup>3</sup> Non-Federal dentists represent 80.73 percent of the students. This rate has been applied to the number in the preceding column on the assumption that Federal dentists are drawn in the same proportion from each geographic division.

and North Central States. Each of these areas retained somewhat fewer recent graduates than might have been anticipated on the basis of the number of dental students trained during 1940-51 in these areas. Among the 15 States in these three geographic divisions only Michigan showed an excess of new dental practitioners over its share of students. In Minnesota, Iowa, North Dakota, South Dakota, and Nebraska about 1 in 4 students apparently failed to return to his home State to establish practice. New York, Pennsylvania, Illinois, and Minnesota each lost more than 100.

New England and the South Atlantic area showed a slight gain between the number of dentists who located there and their share of the students trained. About half of the States in these two divisions had gains; about half, losses. The largest gain, both percentagewise and in numbers, was in Florida, as would be expected from its tremendous population increase since 1940.

The South Central and Mountain States showed equal percentages of new dentists and of students. Thus, in these sections of the country, the degree to which new dentists have established practice closely paralleled the area's share in the pool of dental students maintained while these new dentists were being trained.

### States With Dental Schools

The presence or absence of a dental school in a State does not greatly influence the relationship between the number of recent graduates choosing the State for practice and the State's share of dental students at the time these dentists were being trained. During the period from 1940 to 1952, 21 States and the District of Columbia had active dental schools. As a group these States accounted for 71.9 percent of the

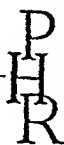
1952 civilian population and 76.6 percent of all the non-Federal dentists. Located in these States in 1952 were 77.3 percent of the non-Federal dentists graduated in 1940-51. They had the same proportion (77.1 percent) of the students in dental schools during the period from 1939-40 to 1950-51. Within this group, however, California gained new dental graduates at the expense of the Middle Atlantic and North Central States.

On the other hand, the 23 States without dental schools supplied 15.9 percent of the students and in return received 15.1 percent of the recent graduates. (Excluded from this comparison are New Jersey and Colorado, whose only dental schools have been closed, and Alabama and Washington, whose training facilities were established for the first time during the period.)

This close correspondence between students trained and new dentists establishing practice, regardless of whether resources for professional training are primarily centered in within-State or in out-of-State dental schools, suggests that the majority of the dentists locating in an area are the same individuals who made up the undergraduates from that area.

### REFERENCES

- (1) American Dental Association: 1953 American dental directory. Chicago, The Association, 1953, 1,097 pp.
- (2) Pennell, E. H., and Pennell, M. Y.: Health manpower source book. 7. Dentists. Public Health Service Publication No. 263, section 7. Washington, D. C., U. S. Government Printing Office, 1955, 159 pp.
- (3) American Dental Association Council on Dental Education: Dental students' register, 1947. Chicago, The Association [1948], 10 pp. See also annual editions for 1943 and 1939.



# Venereal Disease Among Puerto Ricans in New York City

By JULES E. VANDOW, M.D.

FOLLOWING World War II, thousands of Puerto Ricans migrated to the continental United States seeking better economic conditions than were available to them in Puerto Rico. The greatest number of these migrants settled in New York City. About 246,000, or approximately 82 percent of all the Puerto Ricans in the continental United States and 3.1 percent of the city's total population, were located there, according to the 1950 census. As a result of further in-migration and births, these figures have increased to an estimated 500,000—6.2 percent of the total population of New York City. Estimates recently published by the department of city planning indicate that by 1970 Puerto Ricans in New York City may number 1,160,000, or about 13.5 percent of the city's population (1, 2). However, this estimate may have to be revised downward if the 1953 decrease in migration, resulting from increased industrialization in Puerto Rico, is maintained.

From the point of view of the division of social hygiene of the New York City Health Department, it seemed worth while to examine

whatever data were available which could give information regarding the prevalence of syphilis in this large and growing group. This paper is based upon the following reports:

1. Results of the 1953 mass blood testing survey in New York City.
2. Results of blood testing in the Puerto Rican project of the division of social hygiene, New York City Department of Health.
3. A sample study of the statistics of the New York City Health Department social hygiene clinics for the last quarter of 1954.
4. The total venereal disease case reports for the city as a whole for the period January 1–December 31, 1954.

Puerto Ricans are defined as those individuals who were born in Puerto Rico or whose mothers were born there. By this definition, all persons at the Puerto Rican blood testing project of the health department were Puerto Ricans. In the mass blood testing survey, each person was asked where he was born and where his mother was born. In both studies, the race of each person was recorded as white, Negro, or "other." The term "other" refers to dark-complexioned Puerto Ricans who could not be classified as either white or Negro.

The data obtained from the records of the social hygiene clinics and from the venereal disease case reports are far less specific or accurate than data from the records of the Puerto Rican blood testing project and the mass blood testing survey, and conclusions drawn from clinic or morbidity records are of questionable accuracy. Information on the birthplace of the patient or his parents is not requested by

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*Dr. Vandow is chief, division of social hygiene, New York City Department of Health, New York, N. Y., and a special consultant to the Public Health Service. This report of a study conducted with Public Health Service assistance was read as part of a symposium on selective blood testing programs at the Venereal Disease Control Seminar, Regions I and II, Department of Health, Education, and Welfare, Atlantic City, N. J., March 24, 1955.*

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the social hygiene clinics or on the health department venereal disease report form, lest the erroneous impression be given that such information would have a bearing on the type of treatment received. In this connection, it cannot be stressed too strongly that at all health department installations the same treatment is given to all persons, regardless of race or national origin. Studies dealing with such mixed groups reveal information necessary for health authorities to prepare their programs.

### Mass Blood Testing Survey

From May 4 through June 26, 1953, the New York City Health Department conducted a mass blood testing survey. A detailed report of the survey was presented by Dr. Samuel S. Frank at the 1954 Venereal Disease Control Seminar of the Department of Health, Education, and Welfare.

Only Puerto Ricans living in Manhattan will be considered in this report since over 60 percent of the Puerto Ricans in New York City and 89.3 percent of the Puerto Ricans tested live in the Borough of Manhattan. In the mass blood testing survey, 4,885 Puerto Rican born residents of Manhattan—3,870 white and 1,015 nonwhite—were tested for syphilis. The overall positivity rate was 9.6 percent for the 3,870 whites and 11.8 percent for the nonwhites. Using data from the 1950 census and from a study made by the research bureau of the Welfare and Health Council of New York City (3), it was concluded that about 6,238 Puerto Ricans over age 10 residing in three Manhattan health districts, namely, Central Harlem, East Har-

lem, and Riverside, had positive blood tests. Two-thirds (64.8 percent) of the Puerto Ricans in Manhattan live in these three districts. Since slightly more than 58 percent of the positive cases required antisyphilitic treatment, it was further concluded that, as of the time of the survey in 1953, about 3,600 Puerto Ricans over age 10 in these three health districts of Manhattan were in need of treatment.

No conclusions can be drawn about the 40 percent of the Puerto Ricans in New York City who lived outside of Manhattan since most of the persons tested in the survey lived in that borough. Likewise, no conclusions can be drawn for the 38,000 Puerto Ricans living in the four other health districts of Manhattan since too few persons in these health districts were tested.

### Puerto Rican Project

In 1952, a selective blood testing project was set up by the New York City Health Department at the office of the migration division of the Puerto Rico Department of Labor. This office was opened in 1948 to help the new immigrants from Puerto Rico to adjust to a new environment, and it has been extremely helpful in finding jobs, in settling the many problems which result from language difficulties, and in cooperating with all Government and private agencies to promote the general welfare of the Puerto Rican in-migrant.

With the cooperation of the migration division, a clinic was set up in the local office of the Puerto Rican Department of Labor, where several hundred Puerto Ricans gather daily.

**Table 1. Results of serologic examinations for syphilis at the Puerto Rican project of the division of social hygiene, New York City Department of Health**

Results of examination	1952 <sup>1</sup>		1953		1954	
	Number	Percent	Number	Percent	Number	Percent
Total examined	1, 575	100. 0	2, 016	100. 0	1, 760	100. 0
Positive	115	7. 3	137	6. 8	113	6. 4
Previously unknown	104	6. 6	124	6. 2	95	5. 4
Doubtful	(?)	(?)	(?)	(?)	6	. 35

<sup>1</sup> June-December.    <sup>2</sup> No data available.

The clinic is staffed by a Spanish-speaking clerk and a health department physician. At intervals during the morning, the clerk speaks to the group in Spanish over a public address system on general health matters and mentions the fact that a health department physician is available to provide examination and advice. Those requesting a consultation are given a physical examination. At the same time, a blood specimen is drawn and sent to the serologic laboratory. Each patient is then referred to a district health center for a chest X-ray. When a blood test is positive or doubtful, the patient is referred to the nearest health department social hygiene clinic for a repeat blood test and evaluation. Treatment is given in the clinic if it is indicated.

Table 1 summarizes the results of blood testing this group of individuals from June 1952, when the project was started, through December 1954. During this period, 5,351 individuals were tested. Of these, 365 had positive blood tests—a positivity rate of 6.8 percent. Most of the group—323, or 6.0 percent of the total tested—were new cases, not previously known to the division of social hygiene. Over 50 percent had received treatment in Puerto Rico, but the type and adequacy of therapy is not known.

Table 2 summarizes, by age group, race, and sex, 111 cases of syphilis found through the Puerto Rican project during the period July 1954–January 1955. In this table, “other” refers to those patients who cannot be classified as either white or Negro. The race determination is, of course, quite arbitrary, and undoubtedly

the classifications vary greatly, depending on the judgment of the individual clerk. The number of individuals classified as “other” in this study, 38 percent of the entire group, is considerably higher than the 7.6 percent given by the Bureau of the Census.

The preponderance of males over females (81 to 30) probably reflects the fact that more males than females come to the United States from Puerto Rico and that more males than females seek employment at the migration office, so that a higher percentage of males were examined. The greatest number of cases of syphilis—63, or 56.7 percent, was found in the 20-year age period 15–34, reemphasizing the fact that syphilis is a disease of youth. Of course, it is true that the majority of Puerto Ricans who migrate to the continent are the younger people, so that most of the testing is done in this group.

As for the stage of syphilis, 111 of 910 patients examined during the period May 1954–January 1955 were diagnosed as syphilitic; 23 (20.7 percent) had early latent syphilis and 88 (79.3 percent) had late latent syphilis. No cases of primary or secondary syphilis were found.

### Social Hygiene Clinics

A study was made of the total number of patients examined at the social hygiene clinics of the New York City Department of Health during the period October–December 1954 (table 3).

Altogether, 8,736 individuals were examined

**Table 2. Cases of syphilis among Puerto Ricans examined in the Puerto Rican project, New York City Health Department, July 1954–January 1955, by age, sex, and race**

Age group	All races			White			Nonwhite			Other		
	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female
All ages—	111	81	30	57	40	17	11	7	4	43	34	9
Under 15—	13	11	2	9	7	2	1	1	—	3	3	—
15–24—	34	25	9	17	11	6	3	3	—	14	11	3
25–34—	29	19	10	12	7	5	4	2	2	13	10	3
35–44—	15	11	4	8	6	2	2	—	2	5	5	—
45–54—	16	11	5	9	7	2	1	1	—	6	3	3
55–64—	2	2	—	1	1	—	—	—	—	1	1	—
65 and over—	2	2	—	1	1	—	—	—	—	1	1	—

**Table 3. Number and percentage of patients infected with venereal disease, in social hygiene clinics, New York City Health Department, October–December 1954**

Disease	Total		White		Negro		Puerto Rican	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Examined.....	8, 736	100. 0	2, 210	100. 0	5, 360	100. 0	1, 166	100. 0
Infected.....	3, 662	41. 9	641	29. 0	2, 570	47. 9	451	38. 7
Syphilis.....	1, 181	13. 5	200	9. 0	721	13. 4	260	22. 3
Primary and secondary.....	64	. 7	29	1. 3	24	. 5	11	. 9
Early latent.....	204	2. 3	31	1. 4	110	2. 0	63	5. 4
Late and late latent.....	869	10. 0	134	6. 0	566	10. 5	169	14. 5
Congenital.....	44	. 5	6	. 3	21	. 4	17	1. 5
Gonorrhea.....	2, 077	23. 8	321	14. 6	1, 607	30. 0	149	12. 8
Other venereal disease.....	404	4. 6	120	5. 4	242	4. 5	42	3. 6

during this period. Of these, 2,210 were recorded as white, 5,360 as Negro, and 1,166 as Puerto Rican. The race breakdown in the latter group was not recorded. As the table indicates, 1,181, or 13.5 percent of the total number examined, had syphilis. Sixty-one percent of this group were Negroes; the remainder were divided about equally between white (17 percent) and Puerto Ricans (22 percent). In the white group, 200 (9.0 percent) had syphilis, and in the Negro group, 721 (13.4 percent). In the Puerto Rican group, 260 were found to have syphilis. This was 22.3 percent of all the Puerto Ricans examined, almost 9 percent more than was found in the Negro group, a most surprising finding. This high percentage seems to be quite out of proportion to figures obtained from most sources.

There may be several explanations for this high rate of syphilis among Puerto Ricans. First of all, our clinic population is composed of persons with a high venereal disease rate. Over 60 percent of the total number examined sought consultation as a result of either contact investigation or the actual presence of symptoms of venereal infection. It is quite clear that we are not dealing here with the casual groups examined during blood testing surveys. Therefore, it is not surprising to find higher rates of infection among those applying for treatment in our clinics.

Another explanation of the high rate of infection with syphilis in the Puerto Rican group is that there were probably more Puerto Ricans examined than is indicated by the 1,166 figure.

In many instances, Puerto Ricans were not identified as such on the history charts. A sample of several hundred charts bore this out. A number of individuals with typical Puerto Rican names were recorded—quite correctly—as white or Negro, with no indication of their Puerto Rican origin. The number of such individuals in this study is not known. However, if even 500 noninfected individuals listed as white or Negro were Puerto Ricans, the syphilis rate in the Puerto Rican group would drop to about 16 percent. Suffice it to say, this 22.3 percent figure is probably too high.

#### Venereal Disease Case Reports

During 1954, 19,412 new cases of syphilis were reported in New York City, 6,363 in white patients, 9,726 in Negro patients, and 3,323 in "others." The exact character of the latter group is not known. Undoubtedly, many Puerto Ricans are so classified. As has already been pointed out, many Puerto Ricans may be classified as either white or Negro without any indication of their ethnic origin. It is clear, therefore, that no satisfactory conclusions can be drawn from morbidity statistics. Information from surveys is unquestionably more reliable.

#### Summary

1. Data on syphilis infection among Puerto Ricans in New York City taken from the 1953 mass blood testing survey, the Puerto Rican



project, the social hygiene clinics of the New York City Health Department, and the New York City venereal disease morbidity reports for 1954 are presented.

2. The percentages of syphilis infections in Puerto Ricans residing in New York City as recorded in these studies varied considerably and are as follows:

<i>Study</i>	<i>Percent infected</i>
Mass blood testing survey, 1953:	
White.....	9.6
Negro.....	11.8
Puerto Rican project, July.....	6.8
Social hygiene clinics, October-December 1954..	22.3

3. Some of the possible reasons for the differences in these rates are indicated. The most important appears to be that not all Puerto Ricans are designated as such in the venereal

disease case reports and on the records of the social hygiene clinics. Many are classified by race only and are not included in vital statistics for Puerto Ricans.

4. The data considered most reliable were derived from the Puerto Rican project, in which the syphilis infection rate was 6.8 percent.

#### REFERENCES

- (1) New York City Department of City Planning: Population changes in New York City. New York, N. Y., The Department, 1954, 6 pp.
- (2) Jeffe, A. J.: Puerto Rican population of New York City. New York, N. Y., Columbia University Press, 61 pp.
- (3) New York City Welfare and Health Council: Population of Puerto Rican birth in New York City: 1950. New York, N. Y., The Council, 1952, 57 pp.

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## Vaccination Certificates

Complete information and proper authentication are the two requisites for validating certificates of vaccination. The former is the province of the physician; the latter that of the health officer, State or local.

The vaccinating physician can help speed up processing persons for travel abroad by using the International Certificate of Vaccination form on which to record complete immunization data and by instructing the prospective traveler to have the certificate authenticated by the health officer. This form is given with the passport application. If the person is traveling on a tourist card, he may obtain his certificate from the local health department or purchase it from the Superintendent of Documents, Government Printing Office, Washington 25, D. C., at 5 cents a copy. Most travel agencies and automobile clubs also have the certificate.

A health officer's stamp on the certificate is required by international agreement for the purpose of attesting to the fact that the immunizing physician is a practicing physician within the area. This simple expedient reduces the possibility of fraudulent certificates being used.

If the health officer does not have an official stamp or seal, the Public Health Service suggests that he have a stamp made. The stamp should include the term "health officer" and the name and address of the health department.

# *Enforcement of Housing Laws and Housing Rehabilitation*

The rehabilitation of existing substandard housing is an important facet of the prospect for a decent home and a suitable living environment for every American family. Along with the production of new housing, the prevention of blight, and the redevelopment of slum areas, housing rehabilitation can contribute toward a healthful and safe living environment. Much has been learned in the past few years about the specific effects of municipal programs for improving substandard housing. Far more is unknown. This study was undertaken to determine the changes in housing quality relating to health, safety, and livability of dwellings, as a result of compliance with the standards in housing and related ordinances.

The quality of approximately 1,000 dwelling units and their environment in 25 adjacent blocks in a pilot area in East Baltimore was measured by the American Public Health Association Housing Appraisal Method before and after the enforcement of the Baltimore City housing code and related ordinances and regulations in that area. The "before" and "after" conditions were compared. All scores are penalty scores, which means that as the score decreases, the quality improves. As a result of this "before" and "after" comparison, the following results are apparent:

1. The average dwelling penalty score decreased from 93.75 to 60.51, or 35.5 percent.
2. The average subtotal score for facilities decreased from 51.47 to 44.56, or 13.4 percent.
3. The average subtotal score for occupancy decreased from 7.52 to 6.98, or 7.2 percent.
4. The average subtotal score for maintenance decreased from 34.76 to 8.97, or 74.2 percent.
5. The percent of owner occupancy remained at 41.5 percent.
6. The average shelter rent increased \$6.40, from \$36.40 to \$42.80 per dwelling unit per month. The average gross rent increased \$5.70,

from \$48.20 to \$53.90 per dwelling unit per month.

7. The median family income increased from \$239 per month to \$259 per month.

8. The median environmental block penalty



Public Health

MONOGRAPH

No. 34

The accompanying summary covers the principal findings presented in Public Health Monograph No. 34, published concurrently with this issue of Public Health Reports. Mr. Johnson is director of the Research Institute and Construction Department, National Association of Home Builders; Mr. McCaldin is with the Division of Sanitary Engineering Services, Public Health Service.

Readers wishing the data in full may purchase copies of the monograph from the Superintendent of Documents, Government Printing Office, Washington 25, D. C. A limited number of free copies are available to official agencies and others directly concerned on specific request to the Public Inquiries Branch of the Public Health Service. Copies will be found also in the libraries of professional schools and of the major universities and in selected public libraries.

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Johnson, Ralph J., and McCaldin, Ray O.: Housing rehabilitation and enforcement of housing laws. Public Health Monograph No. 34 (Public Health Service Publication No. 451). 34 pages. Illustrated. U. S. Government Printing Office, Washington D. C., 1955. Price 30 cents.

score was 57.5. This is due primarily to penalty points assigned for "land crowding" and "non-residential land use." The environmental survey was not repeated because it was evident that no significant changes occurred in items that would affect the environmental score. An important exception to this was the demolition of two blocks of deteriorated dwellings for the purpose of building a school. However, the dwellings in these two blocks had to be excluded from the "before" universe, since they were demolished before the time of the "after" survey.

9. The results of the examinations of rent and housing quality appear to show that, in the

pilot area during the enforcement period, rent and housing quality bear little or no direct relationship to each other, either before or after enforcement of the housing code.

10. The data indicate that the enforcement effort resulted in significant improvement of the quality of housing in the pilot area, without untoward effect on the residents. As a consequence, the improved dwellings are healthier and safer places to live. Furthermore, the improvement in maintenance scores alone should insure that the useful life of these dwellings will be significantly extended.

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## Federal-State Rehabilitation Program

Marion B. Folsom, Secretary of Health, Education, and Welfare, has invited the "full support" of State governors for the Federal-State program of restoring disabled persons to useful lives.

Congress has increased Federal appropriations from \$23,000,000 in fiscal 1954 to \$27,000,000 in fiscal 1955 and \$33,750,000 for 1956. Legislation passed in 1954 is designed to increase the number of disabled persons restored to employment each year from the current level of 58,000 to 200,000.

The major portion of the appropriations was designated for State programs of vocational rehabilitation and the remainder was made available for training personnel, expanding public and private non-profit rehabilitation facilities, and for research and demonstrations of ways of dealing with disability.

The Office of Vocational Rehabilitation reports that available State funds apparently will permit the States to use all of the appropriated Federal funds during the current fiscal year. With uneven expansion and improvement in rehabilitation activities, however, some States are exceeding the required appropriations and others only partially meeting the expected goals.

Each year some 250,000 persons reach the point of disability at which they require rehabilitation services. Even if the public program can annually achieve 200,000 rehabilitations, a sizable number will continue to rely on private services for help.

# Organized Home Care Programs

Sick persons have been cared for at home from time immemorial. Care usually has been limited to physicians' services and, when it has been available, to nursing care. Rarely has it included the full range of services and the special supplies and equipment so often necessary to meet the total needs of patients.

The current concept of a home care program is one in which selected patients are provided with a full range of services in their homes. These services are planned for and coordinated through one administrative agency or institution.

Comprehensive services to patients at home include:

Physician's services	Housekeeping services
Medical specialist consultation	Laboratory examinations
Nursing service	X-rays
Social service	Drugs and medical supplies
Physical therapy	Prosthetic appliances
Occupational therapy	Hospital and sickroom equipment
Speech therapy	Transportation
Nutrition consultation	

During the past two decades, organized home care programs have been established to make available a range of services to patients at home and to provide a field work experience in a home setting for professional personnel. Comparable information on these programs has been lacking. To meet the need for such information, the Public Health Service and the Commission on Chronic Illness undertook a joint study of 11 home care programs, selected to represent various auspices, different administrative patterns, and broad geographic distribution.

For the purposes of the study, organized home care programs were defined as those having centralized responsibility for the administration and coordination of services to patients and providing at least the minimum of medical, nursing, and social services, and essential drugs



## MONOGRAPH

### No. 35

The accompanying summary covers the principal findings presented in Public Health Monograph No. 35, published concurrently with this issue of Public Health Reports. The study upon which the report is based was a joint project of the Public Health Service and the Commission on Chronic Illness.

The study was conducted and the monograph was prepared by a study staff from the Public Health Service. The director is a physician on the staff of the Division of Public Health Methods. The nursing, medical, social, and statistical consultants on the study staff were in the Chronic Disease Program, Division of Special Health Services. They have since been assigned to other units of the Public Health Service.

Readers wishing the data in full may purchase copies of the monograph from the Superintendent of Documents, Government Printing Office, Washington 25, D. C. A limited number of free copies are available to official agencies and others directly concerned on specific request to the Public Inquiries Branch of the Public Health Service. Copies will be found also in the libraries of professional schools and of major universities and in selected public libraries.

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Waterhouse, Alice M., Bailey, Eleanor C., Gillis, Mory C., and Palmer, Jeanne T.: A study of selected home care programs. Public Health Monograph No. 35 (Public Health Service Publication No. 447). 128 pages. U. S. Government Printing Office, Washington, D. C., 1955. Price 65 cents.

and supplies. Part I of the monograph summarizes the findings, presents conclusions, and suggests guidelines for the establishment of home care programs.

Programs in the study show that they range in size from an annual patient load of less than 100 up to several thousand. Patients of all ages with virtually all types and severity of illness are given care at home. Some programs serve patients with either acute or chronic illness; others provide care to patients with chronic illness only; one serves exclusively patients with tuberculosis. All of the programs make available medical, nursing, and social services; drugs and medical supplies; X-rays and laboratory tests; hospital equipment and sickroom supplies; and transportation. The availability of the other services listed above varied. In all programs, patients could be hospitalized without delay when the need arose.

Of the programs studied, the eight based in hospitals and health departments are administered by physicians. Social workers administer the two programs that are under the auspices of social agencies; and the program sponsored by a nursing agency is administered by a public health nurse.

Wide variation was found in the extent to which the central administrative agency itself provides services or assumes responsibility for arranging for services through other community agencies. In some programs, the major portion of the services are supplied by a home care staff, while in others, services are

provided through community agencies, with the home care staff functioning primarily as the coordinating agent.

Indigent and medically indigent patients only are eligible for services in 10 of the programs. The one exception offers service to patients regardless of financial status through their private physicians, although patients are charged according to their ability to pay.

It was impossible to obtain comparative data on costs of the programs since the items included in the home care budgets varied greatly from one program to another. Moreover, no records were kept of the costs borne by the family or of expenditures by the community for services provided without charge.

A number of the programs are used to provide educational fieldwork experience for graduate and undergraduate medical students, professional and practical nurse students, and graduate students in social work. Teaching methods are still experimental in the home setting and show wide variation in the programs studied.

Part II of the monograph describes each program studied with regard to its origin and development, objectives, organization, administration and operation, and use of home care in professional education. It gives cost and statistical data on types of patients and services.

The appendix presents the types of information collected in the schedules used for the study.



# Noise Health Hazards in the Air Force

By LT. COL. JACK C. CARMICHAEL, USAF, MSC

**D**URING the past 10 years the public has become concerned with the effects of noise. Noise is an unavoidable byproduct of modern power producing machinery. It is a byproduct of force, energy converted to sound. Production of power in prodigious amounts is necessary to effective military aircraft. Inevitably, such power generates noise at extremely high levels.

Industry, too, has encountered noise problems. Within the plant a noisy environment possibly affects efficiency and may damage hearing. Imperfect hearing and nervous strain also reduce the normal margin of safety. Noisy mixers, washers, or vacuum cleaners encounter sales resistance. Noisy products or operations raise acute objections in residential areas. Noise is disparaged as a nuisance, for interference with communications, for damage to hearing, and for other possible effects on health, efficiency, or safety.

The problem is indeed broad. It directly affects the daily lives of the majority. Many excellent papers have covered technical aspects of noise and its control. In this short paper, I shall not attempt to repeat more than the minimum necessary for dealing with my subject,

which is only presented as an introduction to the topic.

For this purpose "noise health hazard" is defined as those aspects of noise for which the Medical Service of the United States Air Force has a responsibility. Noise is defined as any undesirable sound, a sound that interferes with a desirable activity. However, such interference has to be specified. A given sound is not equally effective in masking speech, in interfering with sleep, or in producing permanent hearing loss.

The medical service's responsibilities cover seven major areas:

- Establishment of engineering criteria for noise control.
- Environmental noise surveys.
- Advice on control procedures.
- Evaluations on effectiveness of control programs.
- Personnel protective measures.
- Audiometric examinations.
- Education programs, both on and off the Air Force base.

The engineering aspects of the noise health hazard can best be described by a brief discussion of these responsibilities.

## Establishment of Engineering Criteria

Engineering criteria for noise control are basic to any discussion of the noise problem. The establishment of a single criterion to cover all conditions is not possible. Therefore, a separate criterion must be considered for at least three areas, namely, (a) damage risk, (b) speech communication, and (c) residential living.

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In each area there are unknown factors which complicate the establishment of these criteria. Notwithstanding these unknowns, decisions that involve the interaction of noise and man must be made. The following criteria are based primarily on the Wright Air Development Center (WADC) Technical Report (1).

### **Establishment of Damage-Risk Criteria**

Personnel exposed to noise at damage-risk levels may suffer hearing losses (2). Safe levels would permit personnel to work regularly 8 hours a day for years without serious probability of such damage. Factors to be considered include a wide variation in susceptibility among individuals, duration of exposure, and, especially, the noise spectrum. The damage-risk criteria utilized, it is felt, will assure safety for the majority of exposed personnel. The criteria are given as the maximum permissible noise levels in specific frequency bands. There are eight octave bands used in the frequency range 20–10,000 cycles per second. The maximum allowable sound pressure in each of these bands is shown in the accompanying chart. These values apply to exposure with no ear protection and to continuous daily exposure. An overall sound level is not adequate as a criterion because the damaging action of noise is related to the frequent distribution of the pressure and not to the overall level.

Notwithstanding this, there are overall levels which are of such intensity as to produce known effects. For example, 150 and 160 decibels, regardless of how short the exposure, will produce damage to hearing; exposure to intermittent noises of overall levels of 100 to 130 decibels may cause temporary deafness which may persist for several hours.

### **Criteria for Speech Communication**

The ability to communicate by voice varies in requirements from essential for personnel safety to ease of conducting a personal conversation. The following extract from the WADC technical report (1) presents a discussion of this variation together with the limitations of a criterion.

"In many areas, efficient performance of task

is often dependent upon the ability of people to talk to each other. Whether the environment is a conference room or a machine shop, noise conditions should be adjusted to permit communication suitable to the task that is to be performed. The type of communication desired may be of varying kinds, from conversation in a normal voice, at say 20 feet, to shouting danger signals at a distance of 6 inches from the listener's ear. The acceptable levels of the masking noise are dependent, therefore, upon the particular task involved and upon the degree to which speech communication is important in the performance of these tasks, or in the maintenance of adequate morale among employees. In establishing each communication criterion, account is taken of not only the level of the masking noise, but also the vocabulary to be used in the communication, the voice level, the distance from the speaker to the listener, etc. Of primary importance is the spectrum of the masking noise. The concept of the SIL (speech interference level) was originally based on data derived from experiments with continuous masking noise. If the noise is irregular or interrupted in time, the intelligibility is affected in a way in which the SIL does not predict. At the present time, there are insufficient data to delineate the limits of intensity, shape of spectrum, and time character of the noise within which the application of the SIL is valid. It is fortunate, however, that the masking noises encountered in most practical situations have a reasonably smooth spectrum and a uniform time character. In such situations, the SIL does provide a reasonably good approximation of the effectiveness of a noise in masking speech. The validity of the use of the SIL is justified by many observations in the field. With these limitations in mind, it can be concluded that the ability to communicate by voice in the presence of noise is determined essentially by four factors:

- "1. The SIL of the masking noise.
- "2. The voice level used by the talker.
- "3. The distance from the talker's mouth to the listener's ear.
- "4. The nature of the vocabulary used in communications."

Therefore, criteria for speech communications vary with the type of communications

required, established at four levels. The chart is a plot of these criteria.

On the chart, SC-75 indicates overall sound levels in the 8 bands with an index of 75 (the arithmetic mean of the levels in frequencies of 600-1200, 1200-2400, and 2400-4800). At this level, minimum speech communications require a very loud voice at 1 foot.

At SC-65, intermittent communication is possible with a raised voice at 2 feet, very loud voice at 4 feet, and shouting at 8 feet.

At SC-55, continuous communication in work areas, such as business, secretarial, or control rooms, requires a normal voice at 3 feet, raised voice at 6 feet, and a very loud voice at 12 feet.

At SC-45, a normal voice serves at 10 feet in such locations as private offices or conference rooms.

### Criteria for Residential Living

The reaction of people to a noise in their home is the most difficult criterion to establish. There are many and varied factors which influence a public reaction, the proper evaluation of which requires experts. The following brief quotation from the WADC technical report serves to outline the problem involved:

"There are essentially two aspects to the analysis of the inter-reaction between an intruding noise and human being exposed to the noise. A physiologist would call these aspects stimulus and response. The stimulus function can, as a first approximation, be defined by a physical description of the noise to which the human beings are exposed. It may, however, also be necessary to describe the physical characteristics of noise to which a particular group of people have been exposed in the past, in order to evaluate the degree to which they have become adjusted to a noisy environment. The response of residents is measured through expressions of annoyance, complaints, or even through legal action. Our task is to be able to predict their response from knowledge of the stimulus function, past and present. The many factors involved in the establishment of residential criteria preclude their discussion in detail in this paper. I would like to mention a few of the considerations which must be taken into account. Experience has shown that there

are at least seven large independent characteristics of a noise stimulus that control the response behavior of a community exposed to the noise, namely:

"1. *Spectrum character.* A noise spectrum that contains audible pure tone or single frequency components appears to be more annoying than a spectrum that is reasonably continuous.

"2. *Peak factor.* A noise that is reasonably continuous in time, at least over periods of a few seconds or more, is assumed to be less annoying than an impulse-type of noise.

"3. *Repetitive character.* In addition to the short-time peak factor discussed above, the repetitive factor of the intruding noise influences a neighborhood reaction to a large degree.

"4. *Level of background noise.* Residents in areas with low background level are more likely to react to intruding noise of fairly low level than those in areas in which the background noise partially masks the intruding noise.

"5. *Time of day.* Most residents agree that intruding noise is more tolerable in the daytime than during the evening.

"6. *Adjustment to exposure.* Experience has shown that residents can adjust to a varying extent to an intruding noise after repeated exposures.

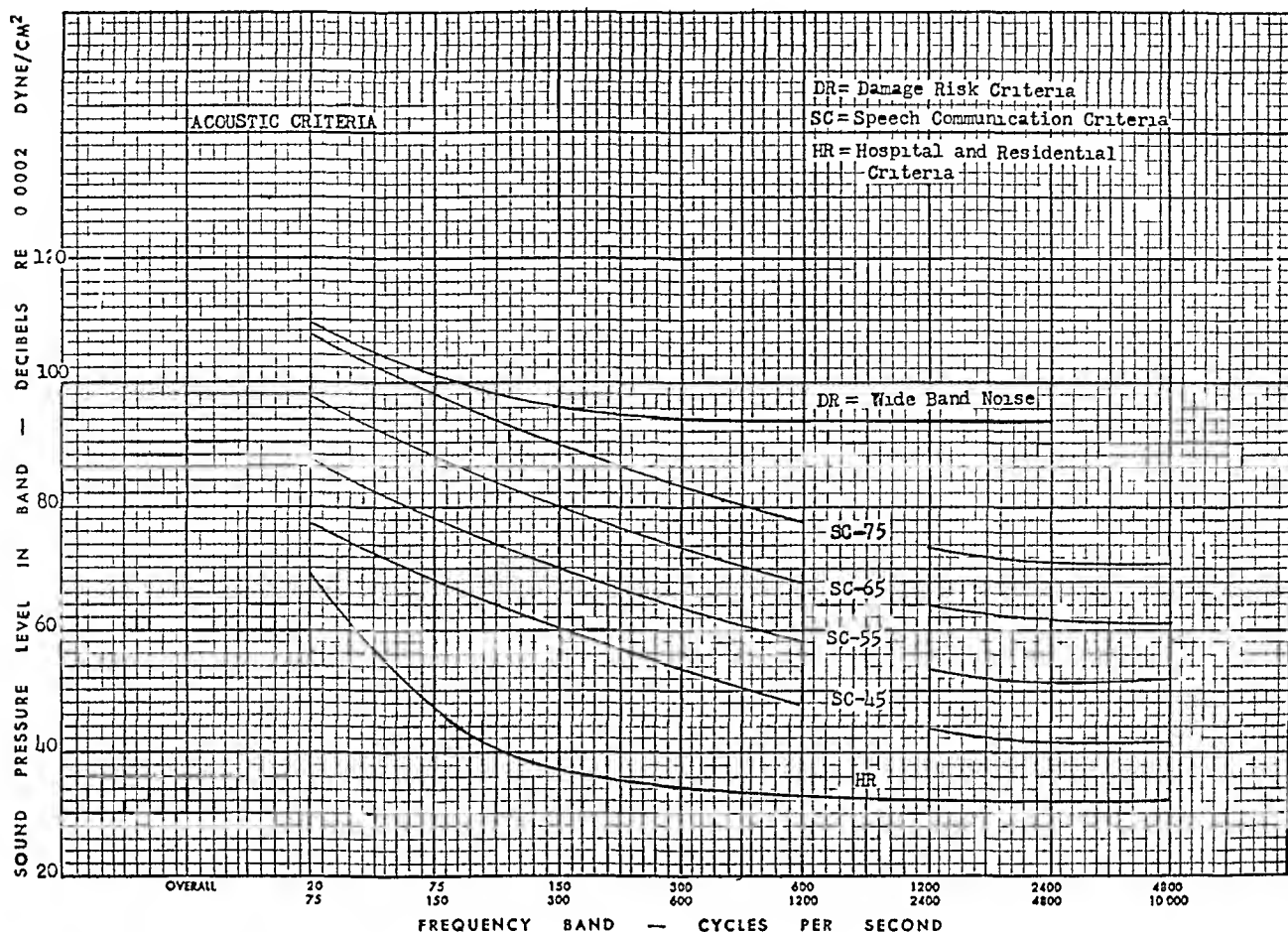
"7. *Other factors.* In addition to the physical factors listed above, factors of a psychological nature influence neighborhood reaction to an intruding noise, though by no means to a constant degree. Such questions as continuation of the noise and public relations between the community and those causing the noise may modify the noise rating to a marked extent."

### Environmental Noise Surveys

A noise survey, in essence, is the same as any engineering survey. It requires advance planning to assure that the goal is amply stated, that adequate and properly calibrated equipment and personnel are available. The many variables in a noise survey preclude the establishment of a set procedure equally applicable to all conditions. It is imperative that the engineer planning the survey take into account the peculiarities of the particular problem. Certain guiding principles apply to all surveys.



# Noise levels in frequency bands covering proposed criteria for damage risk, speech communication, and residential living.



Of particular importance are records of ambient temperature and humidity, of wind velocity and direction, of the location of facilities and time of testing, of types and serial numbers of equipment with particular reference to microphones and cables used, and, finally, of the individual observers making the measurements. General aspects of the survey are:

A description of the area to be surveyed with ample data concerning the facility. For example, a survey of an office area, hospital, or any interior should note the dimensions and type of surfaces, location and type of doors and windows, type of seal on the doors and windows, and type of use for which the facility is designed. In an area survey, the map should include all residential areas or industrial facilities.

The next major step in the survey is the location of the primary source of the noise. Descriptions of the source of noise should defi-

nately be included with a time schedule of noise production over a 24-hour period, as well as other data pertinent to the cause of the noise or factors which might increase noise from the primary source. The location and adequate data should be provided on each secondary source of noise. The orientation of the microphones with respect to a noise source should be specified in all cases, as well as other peculiarities which affect a noise reading such as temperature of microphone, maintenance and calibration tests of equipment, and temperature and humidity of the environment on the day and at the time the readings are made.

In the selection of equipment it is well understood that microphones should be appropriate to the task. Certain microphones are designed for low sound levels, others for high sound levels. One may be designed for low frequency selectivity, another for high fre-

quency. Cables and the use of cables on the surveys call for similar discrimination. In general, where short cables are used, most microphones can be used without a corrective factor. Where a long cable is necessary, a correction will generally be required. These are but a few of the variables encountered in a noise survey.

Before an engineer attempts a survey, he should avail himself of data as a guide to selection of sound measuring equipment. Uniform practices for the measurement of aircraft noise are contained in the Aircraft Technical Committee Report No. ARTC-2 (3).

### Advice on Corrective Action

In general the control of the source of noise is under the direction of the operator. As a consultant to the operator, the sanitary and industrial hygiene engineer submits recommendations for the correction of noise hazards. The engineer is not limited as to any particular aspect of the control program; his advice and recommendations should cover all aspects in which he is technically competent. Engineers in the Medical Service of the Air Force recommend sites for engine test cells, engine runup areas, and barracks or office buildings in relation to sources of noise. Other recommendations include soundproofing measures for buildings which must be in a noisy environment.

In many instances engineers have been able to eliminate or materially reduce noise at the source. This is particularly true of industrial noises or noises emanating from an operating procedure which can be controlled at the source. As to the aircraft engine, since the noise is directly related with the power produced, it is not feasible to reduce the noise at the source, although research is pursued with that objective. Noise is reduced in part through improved performance of aircraft engines, particularly where rough burning of engine fuels has been eliminated. It has been possible also to reduce the noise of the explosion on the afterburner of the jet aircraft.

Where noise cannot be eliminated or sufficiently reduced at the source, the engineer recommends, as a prime measure, the use of

acoustic material. Other methods include changing the relative position between source of the noise and those affected—structural changes to reduce vibration noises, or construction of sound barriers. Corrective action in noise control parallels other environmental conditions. It calls for application of all available disciplines. Each problem must be studied of itself, with the aim of arriving at the most economical and feasible solution.

### Personnel Protective Measures

The engineers of the Medical Service of the Air Force have a prime responsibility to assure that the corrective action taken following the location of a noise hazard is adequate and effective. The responsibility here is primarily the protection of personnel. In addition, it is an evaluation to assure that the economical method will suffice.

Personal protective equipment for personnel is limited by obstacles in design. At the present time, the most effective ear defender is a properly fitting earplug. The use of earmuffs and helmets, which with earplugs give some additional protection, is limited by the nature of the seal. All personnel exposed to a hazardous noise level must be fully acquainted with the need for the protection afforded by properly fitted ear defenders. Engineers owe it to the personnel to see that such equipment is available.

In addition to the personal protective equipment, personnel protection is secured through previously noted control measures. Specific examples include a properly designed control booth for operators at engine test cells and sound suppression in control towers, classrooms, and barracks.

The engineer through his contacts in his daily work is an ideal member of the medical service to impress on supervisors as well as workmen the importance and necessity of wearing earplugs and other ear defenders in a noisy environment. In addition, they can serve as ambassadors in acquainting the personnel, both on and off the base, with noise hazards and corrective steps.

Engineers of the medical service must see that properly designed and equipped audiometer

rooms are available for audiometric examinations of personnel exposed to high noise levels. In designing an audiometer room, consideration must be given to its environment. Operating agencies desire the room to be located in the immediate industrial area to save time of personnel. Such a location places an additional burden and expense on the acoustical design. The engineers, through their surveys, establish the areas where personnel are exposed to hazardous noise levels. Such surveys determine the audiometric testing cycle.

This brief review reveals the scope of the problem of noise in modern living. In many areas, knowledge is incomplete, but current and future research may reduce the uncertainties.

#### REFERENCES

- (1) Handbook of acoustic noise control. Wright Air Development Center Report 52-204. Vol. 1. Physical acoustics by R. H. Bolt, L. L. Beranek, and R. B. Newman; Vol. 2. Noise and man by W. A. Rosenblith, K. N. Stevens, and staff (Bolt, Beranek, and Newman). Wright-Patterson Air Force Base, Ohio, Wright Air Development Center, 1952.
- (2) Parraek, H. O.: Noise—Air base planning. Report No. SC-BAU-51-2. Wright-Patterson Air Force Base, Ohio, Wright Air Development Center, 1951.
- (3) Aircraft Research and Testing Committee: Uniform practices for the measurement of aircraft noise. Aircraft Technical Committee Report No. ARTC-2. Washington, D. C., Aircraft Industries Association, 1952.

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## 1956 Community Health Week

March 18-24, 1956, has been designated Community Health Week, to be headlined under the banner "Let's Do More About Health." The National Health Council and the United States Junior Chamber of Commerce are the sponsoring organizations.

The success of the initial observance of Community Health Week in March 1955 led the sponsoring organizations to their decision to repeat the performance. Last spring, 180,000 Jaycees across the country helped to arrange health fairs and rally the people to attend. Their efforts inspired television and radio shows as well as newspaper features and special news sections telling the people about needs of local health services and the health resources to look for in their own community.

The United States Junior Chamber of Commerce will have available after January 1 a work kit which it has produced as a guide for those engaged in organizing activities for a community health week. The kit will be distributed to Jaycee chapters requesting it from the Tulsa, Okla., headquarters of the junior chamber. In communities without Jaycee chapters, local affiliates of national organizations may request kits from the National Health Council, 1790 Broadway, New York 19, N. Y.

The contents of the kit, prepared by members of the staff of the National Health Council and its member agencies, include leaflets describing "Newspaper Health Supplements," "Health Fairs," and "Movies Tonight"; a checklist of projects which a community may launch during health week, such as accident prevention campaigns, establishment of preschool clinics, fluoridation of municipal water supplies; and a list of National Health Council member agencies to facilitate community cooperation.

*A fundamental goal of research in this field is to provide bases for the formulation of public health policy. Using examples of research undertaken at the Robert A. Taft Sanitary Engineering Center and elsewhere, the author discusses the role of statistical concepts in providing these bases.*

## Statistics Applied to Research in Environmental Sanitation

By EUGENE K. HARRIS, Ph.D.

PROBABLY the most valuable application of statistical concepts in the environmental sanitation field is in determining the extent to which a given situation represents a public health problem. Another job, almost as important, is that of analyzing objectively the technical procedures on which much of public health policy and action is based.

The second task is often the easier. Two investigations, one on milk and the other on shellfish pollution carried out by personnel of the Robert A. Taft Engineering Center, may serve as examples. The first of these, an analysis of variation in the direct microscopic clump count on milk, has been mentioned briefly by Black and Myers (1). The study was small in scale, yielding results which are only indicative. Its purpose was to analyze variation in milk counts into two broad components: variation in the

counts of a single observer and variation attributed to differences between observers.

### The Milk Clump Count Study

The most interesting part of the milk clump count study concerns the examination of milk with 100,000 to 200,000 bacteria per milliliter (the upper half of the grade A range in raw milk to be pasteurized). Cooperation was obtained from four men, all with long experience in the direct microscopic count. Each man prepared five replicate films from the same lot of milk, following the procedures of 1948 Standard Methods for the Examination of Dairy Products (2). The number of fields read was determined by each observer on the basis of his counts on the first film examined, using the table in standard methods as a guide.

In this way, 20 counts were generated. Analysis revealed that the variation (standard deviation) attributable to differences between observers amounted to 63 percent of the mean count, while variation "within" the average observer amounted to 34 percent of the mean count.

Variation between observers probably arises chiefly from differences in ability to distinguish bacterial clumps when examining a film.

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*Dr. Harris, an analytical statistician with the Robert A. Taft Sanitary Engineering Center, Public Health Service, Cincinnati, Ohio, presented this paper before a joint session of the laboratory and epidemiology sections of the Western Branch of the American Public Health Association, meeting in Seattle, Wash., May 11, 1954.*

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Nevertheless, a test was made of the possibility that mixing of the original sample was incomplete so that readers received portions of varying density or that individual differences in preparing films resulted in varying mean counts. Each observer examined one slide selected at random from each of the sets prepared by his colleagues. In no case did the mean or the variances of the counts on these films differ significantly from the corresponding statistics on his own slides. Apparently, some individuals tend to read "high" and others "low."

For 3 of the 4 readers, the observer variation was about as much as would be expected on the basis of a random distribution of bacterial clumps over a film. The fourth reader, who reported the lowest mean count—about 100,000 per milliliter—showed significant nonrandom variation, due most likely to fluctuations in judgment, attention, and other personal factors.

This small milk count study has been described partly to illustrate a simple statistical design for analyzing the precision of a laboratory method, but more especially to emphasize the importance of the subjective, personal factor in laboratory diagnosis. Improvements in mechanical technique, or in the composition of materials, will be of little worth if the persons applying the methods remain highly variable in their interpretation of what they see.

Finally, what administrative use can be made of these results? They indicate that a single direct microscopic count may not be too reliable a measure of bacterial density, chiefly because of great variation among observers. On the other hand, 3 of the 4 observers exhibited a high degree of internal consistency. It seems, therefore, that from a practical standpoint, the direct count will be most effective when used by a single experienced observer in judging the continuing quality of milk produced over a long time by a given dairy farm. Once the observer has established his own baseline of quality for a certain milk, the direct count will enable him to detect gross deviations from that baseline (that is, counts averaging at least 50 percent greater than his usual observations) regardless of whether he is by nature a "high"

or a "low" reader. The fact that well-operated dairy farms are able to keep raw milk counts far below the grade A limit adds weight to the argument that the direct count is more efficient as a measure of continued quality control than as a criterion for grading any one lot of milk.

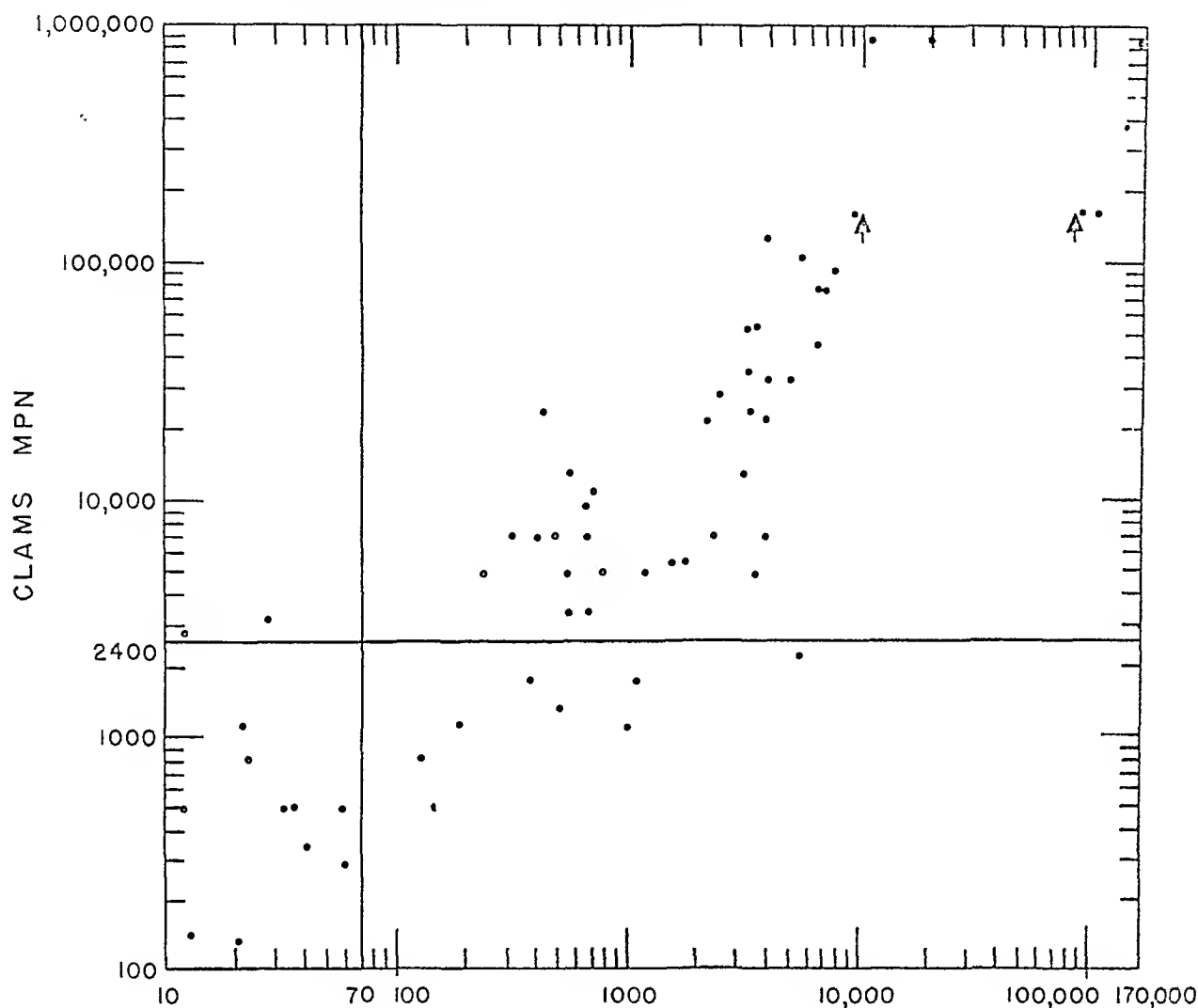
### Shellfish Pollution Study

Another study which offers some interesting concepts to the health official desiring an objective basis for policymaking is that by the Shellfish Sanitation Laboratory operated as a field station under the center. It concerns the relationship between the density of coliform organisms in water overlying shellfish beds and the coliform density in the shellfish themselves. The data obtained in this investigation are now in the process of final analysis for publication and hence will not be discussed in detail. The study is mentioned here for illustrative purposes only.

The Manual of Recommended Practice for Sanitary Control of the Shellfish Industry (3) classifies shellfish growing areas according to the median most probable number (MPN) of coliform organisms in water samples collected during the harvesting season. A median less than 70 per 100 milliliters defines an approved area; between 70 and 700, a restricted area; and greater than 700, an area closed to shellfish growing. Of course, this is not the only basis for judging shellfish quality; the sanitary survey is doubtless the most effective guide. Nevertheless, numerical standards have a powerful attraction, and, in order to justify certain water standards, we should know the effect on the shellfish of a given level of pollution in the overlying water.

In the laboratory study, hard-shelled clams (*Venus mercenaria*), soft-shelled clams (*Mya arenaria*), and oysters were studied in laboratory flats under widely varying water pollution loads at temperatures ranging from 4° to 23° C. Most probable number determinations were made on both water and shellfish samples at frequent intervals, according to the procedures recommended by the American Public Health Association (4). Most of the experiments ran from 3 to 4 days, some from 2 to 3 days, and one or two slightly longer than 4 days. Since a

Water and clam MPN's in moderate temperature range ( $8^{\circ}$ – $17^{\circ}$  C.). Arrows designate MPN's not precisely determined but greater than the charted values.



great many more water than shellfish samples were taken, each shellfish MPN was matched with a geometric mean MPN in water based on samplings made during a prior 12-hour period.

Water and shellfish MPN's were plotted as abscissa and ordinate, respectively, on a logarithmic grid for each species of shellfish in each of three temperature ranges. The resulting scatter diagrams may be subjected to a number of different analyses. Before proceeding, it is well to emphasize that the data of this particular study were obtained from relatively small numbers of shellfish subjected to controlled pollution under laboratory conditions. Nevertheless, this type of data, namely, matching water-shellfish coliform indexes must arise when

studying the relation between water pollution and the sanitary quality of shellfish.

The following plan for analysis of such data appears to be the simplest and probably the most useful to the public health official. For example, from one of the graphs for soft-shelled clams, let us select some prominent MPN's per 100 milliliters in water and clams, say 70 and 2,400. The manual suggests that an MPN of 2,400 or more coliform organisms per 100 milliliters occurring in clams taken from the growing area indicates unfavorable conditions or practices surrounding the production of these clams and necessitates further investigation.

A vertical line is drawn intercepting the X-axis at  $X=70$  and a horizontal line intercepting

the  $Y$ -axis at  $Y=2,400$ . As shown in the figure, these lines cut the scatter diagram into four blocks, which may be labeled northeast, southeast, southwest, and northwest.

Let us assume that the sanitary quality of clams in which the MPN exceeds 2,400 coliform organisms per 100 milliliters should be regarded with suspicion. Then, the northwest and southeast blocks represent risks incurred in operating at a mean MPN of 70 for approved waters. The proportion of northwest points to all western points estimates the probability that clams of suspicious sanitary quality will be harvested, while the proportion of southeast points to all eastern points estimates the probability that satisfactory clams will not be accepted immediately but will at least have to undergo further purification. We can reduce the risk of harvesting suspicious clams by lowering the permissible MPN in water, but this increases the risk of rejecting acceptable clams. It becomes necessary to define quantitatively the relative importance attached to each risk.

Suppose, however, that some number other than 2,400 is decided upon as a critical point with respect to the sanitary quality of clams. Then, the numerical estimates of the risks change and with them the bases for a decision of permissible water pollution. The question of proper limits is a very complicated one. This type of analysis merely offers the health official one quantitative criterion by which to estimate the effects of proposed limits.

### Hazard Indicators

We have mentioned that statistical concepts achieve their greatest value in public health research when they can be used to determine to what extent a given environmental situation represents a public health problem. This statement needs further definition. As a rule, official recognition of a health hazard results from an outbreak of disease followed closely by epidemiological investigation. However, in order to translate mere recognition of a health hazard into an effective program for its control, two basic conditions must be met. One or more variables must be selected to serve as indicators of the hazard, and the variables must be calibrated so that by measuring them we may

measure the severity of the hazard. This latter condition implies that quantitative research is necessary to determine, at least approximately, that point on the scale at which the hazard becomes sufficiently great to merit official action.

As examples of attempts to measure the relationship between indicator variables and health hazards, two investigations will be summarized briefly. The first consists of a series of studies by A. H. Stevenson and R. S. Smith of the center and T. D. Woolsey of the Division of Public Health Methods, Public Health Service, on the relation between bathing water quality and health (5).

#### *Natural Bathing Water Quality*

Three different classes of natural bathing water were studied: a great lake, an inland river and nearby swimming pool, and a coastal water. Selected in each study were two swimming areas which appeared on the basis of past records to differ markedly in bacterial quality but which were used regularly by families of similar socioeconomic levels.

Illnesses recorded during the study were eye, ear, nose, and throat ailments, gastrointestinal disturbances, and skin irritations. The two occurrences of significant positive correlation between illness incidence rate and bathing water quality are of particular interest since in each case the comparison was between extremes of bacterial quality, namely, median MPN's of 2,700 and 2,300 on the one hand, and less than 3 and 43 on the other. In one instance, only gastrointestinal illness rates were concerned; in the other, the correlation extended to all types of reported illness. In view of the general lack of correlation found between illness rates and variations of coliform density in the range up to about 700, the authors believe that "some of the strictest bacterial quality requirements now existent for natural bathing water might be relaxed. . . ."

Apart from the value of the findings, these studies are noteworthy because of the manner in which the data were collected. Each participating family maintained a daily diary of swimming and illness experience, recording the information on a calendar form according to a special code. This way of gathering information is in contrast to the interview method



whereby a trained investigator calls upon the family at scheduled times, eliciting information on morbidity during the preceding interval. The interview method suffers from the disadvantage that frequent visits are required in order to avoid the dangers of bias due to lapses of memory on the part of the respondent, especially for minor illnesses which were of chief concern in the bathing water studies.

On the other hand, a morbidity survey which requires the cooperating family not only to supply but also to record the data is subject to the risks of illegible and inadequate information. These difficulties were avoided in the bathing water studies by providing a simple code printed below the calendar; by carefully reviewing the diary form with the housewife; and, finally, by maintaining contact with the family during the study through telephone, mail, and an occasional personal visit.

#### *Meteorological Factors and Air Pollution*

The second example of quantitative research into the effects of environmental factors on health is in the field of air pollution. This project is the first step in a search for the possible health effects of minor changes in weather and atmospheric pollution. With respect to the effects of weekly variations in weather factors, an early study by L. J. Reed (6) of Johns Hopkins University, using statistics of England and Wales for the years 1865 to 1914, is of interest.

Weekly mortality records from the city of Cincinnati are being examined to find out if a pattern of variation exists which may be correlated with local meteorological factors and especially with some measure of air pollution. The mortality data on punchcards have been made available through the cooperation of the city health department. This study initiated by Dr. K. H. Lewis of the center and now being carried on under the writer's immediate supervision is the sort of work which may be undertaken by State or city health departments.

Progress to date of the Lewis study may be outlined as follows. Mortality during the period from January 1952 to December 1954 has been tabulated for 22 causes of death by age group and week of death. From these tabulations, four causes, comprising a group of cardiovascular diseases, have been selected. The

successive weekly totals for all ages have been plotted on graphs for each year. The same has been done with deaths from respiratory causes and total deaths from all causes, but so far analysis has been confined to the cardiovascular group.

The general trend of cardiovascular deaths in any year could be fitted very well by a simple curve. Selected in each year were short periods of time during which significant deviations from the curve were apparent—either peaks or dips. The same techniques are now being applied to various weather factors (temperature, pressure, percent of possible sunshine, and so on) for which weekly medians or totals may be calculated from publications of the Cincinnati office of the United States Weather Bureau, and to a continuous measure of air pollution—the intensity of staining of filter paper in a Hiemenz automatic smoke sampler. Information on this variable has been obtained through the cooperation of the Cincinnati Bureau of Smoke Inspection. It is possible that obvious deviations from the general mortality trend will be clearly associated with similar deviations in one or more environmental factors. More likely, in order to reveal any correlations, it will be necessary to analyze all weekly deviations observed in mortality, weather, and air pollution pictures.

#### **Summary and Conclusions**

This discussion has implied the need for careful research in defining the nature and content of control programs in environmental sanitation. Nevertheless, it is a common experience of health officials to be called upon for action in an emergency situation and to have to devote to the operation of an untested control program resources that might otherwise be spent on research leading to a more efficient program. There can be no criticism of this when the need is obvious and when at least the qualitative aspects of the necessary control procedures are known. Eventually, however, every such procedure calls for reevaluation, sometimes in terms of errors of measurement but always in terms of health significance. By means of specific examples, I have tried to illustrate the ways in which research based on



statistical concepts may aid in the evaluation of current sanitation programs and in the planning of new ones.

#### REFERENCES

- (1) Black, L. A., and Myers, R. P.: Some causes of variation in direct microscopic counts. Report of the New York State Association of Milk Sanitarians. Albany, The Association, 1952, pp. 9-21.
- (2) American Public Health Association: Standard methods for the examination of dairy products. Ed. 9. New York, N. Y., The Association, 1948, pp. 116-118.
- (3) U. S. Public Health Service: Manual of recommended practice for sanitary control of the shellfish industry. 1946 recommendations of the Public Health Service. Public Health Service - Pub. No. 33. Washington, D. C., U. S. Government Printing Office, 1950.
- (4) Recommended procedure for the bacteriological examination of shellfish and shellfish waters. [Report of the Standard Methods Committee for the Examination of Shellfish.] Am. J. Pub. Health 37: 1121-1129, September 1947.
- (5) Stevenson, A. H.: Studies of bathing water quality and health. Am. J. Pub. Health 43: 529-538, May 1953.
- (6) Reed, L. J.: Correlations between climatic factors and death rates. Proc. Internat. Math. Cong. 2: 881-883 (1924).

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## Harold R. Sandstead, 1904-1955

Dr. Harold R. Sandstead, nutrition expert on the staff of the National Institute of Arthritis and Metabolic Diseases, was killed in the November 1, 1955, airplane crash in Colorado. Dr. Sandstead held the rank of medical director in the commissioned officer corps of the Public Health Service. For the past year he was executive director of the Interdepartmental Committee on Nutrition for National Defense. He joined the Service in 1934.

Dr. Sandstead was honored in 1945 by the Netherlands Government for his work on nutrition in Holland. He also received the Bronze Star for this work from the United States Army. In 1954, the Army awarded him the Bronze Star with Oak Leaf Cluster for his work on nutrition in South Korea. A memorial fund for medical students has been established in Dr. Sandstead's name by Vanderbilt University, Nashville, Tenn., where he served as assistant professor of medicine during 1940-53.

Printed in a recent issue of the Netherlands *Tijdschrift voor Sociale Geneeskunde (Journal of Social Medicine)* was a tribute to Dr. Harold Sandstead. Excerpts from this tribute, freely translated, are published below at the request of Dr. C. Banning, chief medical health officer of the Netherlands.

"Dr. Sandstead's name transports us directly back to the first months after the liberation. In our memories, we see this outstanding American laboring day and night to assist in the rebuilding of the Netherlands.

"On the SHAEF mission, he was prominent among those who hastened to help our country. He was

particularly interested in the problem of starvation and malnutrition. Sandy, as many friends called him, took an important part in investigating malnutrition, especially in the western part of our country.

"With the late Sir Jack Drummond and Prof. G. C. E. Burger, he completed a report on Malnutrition and Starvation in Western Netherlands. In the introduction to this report, our Minister of Social Affairs thanked the composers, calling them the international 'triumvirate.' Concerning Dr. Sandstead, the Minister says that Lt. Col. H. R. Sandstead, as head of the health section of the SHAEF mission to the Netherlands, contributed much to the recovery of the health of the population of our country and to the relief activity.

"No wonder that in October 1945 our Queen honored Dr. Sandstead as Officier in de Orde van Oranje-Nassau met de Zwaarden (Officer of Orange-Nassau with the Swords).

"His more intimate friends know that Sandy not only gave material help and took care of the supply of food, medicine, and equipment, but he was a man of warm feelings who also gave moral support and assistance. This American officer understood and participated in the sorrow the occupation had caused us.

"From my personal experience, I know that Holland had a special place in Sandy's heart. He was deeply interested in everything happening in Holland, and he rejoiced in the swift rebuilding of our country. Holland has lost a great American friend. To his very many friends here, his death has left a great vacuum."

## Public Sewage Treatment Plant Construction, 1954

*Public Health Service Publication No. 453. 1955. 18 pages. 20 cents.*

Public Sewage Treatment Plant Construction for the calendar year 1954 supplements and brings up to date the information contained in the reports for 1952 (PHS Pub. No. 291) and 1953 (PHS Pub. No. 409). The report indicates the progress made by municipalities during 1954 in providing the sewage treatment facilities necessary to prevent pollution of water resources on which downstream water users depend.

Contracts were awarded for 716 projects costing \$227.5 million, an increase, after adjustment for cost index fluctuation, of 21 percent over 1953 construction. Of the 1954 contracts, 366 were for new plants, costing \$143.2 million, and 350 were for additions, enlargements, or replacements of existing plants, costing \$84.3 million. The appendix to the report lists individual projects, by State, giving type of construction and cost of each.

## Venereal Disease Clinics Directory

*Public Health Service Publication No. 257. Revised 1955. 144 pages. 70 cents.*

Names and addresses of the Nation's venereal disease diagnostic and treatment facilities, days and hours of service, and fee basis for use of each facility are listed in this directory.

It is published biennially by the Public Health Service Venereal Disease Program to provide the latest information on these clinics and other facilities. The material included in the 1955 edition has been compiled from information supplied by the health departments of the 48 States; the Territories of Alaska,

Hawaii, Puerto Rico, and the Virgin Islands; and by the Division of Hospitals of the Public Health Service.

Summaries of premarital and prenatal laws as they pertain to venereal disease are given for each State and Territory having such laws, and laboratory facilities available in each State are described.

The current directory shows that 40 States and 3 Territories have premarital laws requiring blood tests and physical examinations for venereal disease, while 42 States and 3 Territories have prenatal laws requiring blood tests for pregnant women.

## Nutrition and Healthy Growth

*Children's Bureau Publication No. 362. 1955. 36 pages. 20 cents.*

Quantities as well as kinds of food that will contribute most to good nutrition during pregnancy and throughout childhood are presented in this pamphlet, which is addressed primarily to teachers, nurses, social workers, and other personnel working with parents. Sample meals for children at varying stages of development are given. Common foods and the contribution each makes to good nutrition are listed in an appendix.

## A Comprehensive Program for Water Pollution Control

### Lower Portion of Upper Mississippi Basin

*Public Health Service Publication No. 450. Water Pollution Control Series No. 71. 1955. 53 pages; illustrated.*

Developed in cooperation with water pollution control agencies of Iowa, Minnesota, and Wisconsin and adopted by the Public Health Service, this program is based on data available as of November 1, 1954.

Among the recommendations for municipalities are: sewage treatment plants for 26 municipalities and institutions now discharging untreated sewage to the basin watercourses; replacement of 9 existing plants; enlargement or additions for 33 plants; and connection to existing municipal sewers of 1 plant. For industries, requirements include: 66 new treatment plants; enlargement or additions for 33 existing plants; replacement of 2 plants; and connection to existing municipal sewers of 4 plants.

## Industrial Waste Guide to the Wool Processing Industry

*Public Health Service Publication No. 438. 1955. 14 pages; illustrated. 15 cents.*

Third in a series of Industrial Waste Guides, this one is intended primarily to aid operators of woolen mills and commission processors in using, reducing, and otherwise suitably disposing of their wastes. Like its predecessors in the series (the first was for the milk processing industry, and the second, for the meat industry), it is based on two premises. First, the greatest possible recovery, use, and reduction of wastes is necessary for the most economical production; and, second, protection of the Nation's limited

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This section carries announcements of all new Public Health Service publications and of selected new publications on health topics prepared by other Federal Government agencies.

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water resources for maximum use is necessary in order to bolster our national health and economic growth.

The guide was prepared for the Public Health Service by the Stream Pollution Abatement Committee of the American Association of Textile Chemists and Colorists under the sponsorship of the National Technical Task Committee on Industrial Wastes.

## The Halogenated Hydrocarbons, Toxicity, and Potential Dangers

*Public Health Service Publication No. 414. 1955. By W. F. von Oettingen. 430 pages; illustrated. \$2.50.*

Intended for physicians, entomologists, engineers, and persons inter-

ested in agriculture, this publication deals with the toxicity and potential dangers of various halogenated hydrocarbons—aliphatic, olefinic, cyclic, aromatic, and aliphatic-aromatic. It covers, therefore, a great number of industrial solvents, refrigerants, fumigants, and insecticides.

Directions are included for the prevention and treatment of poisoning in humans by these chemicals.

## PHS Films

### Milk Sanitation Series: Cleaning-in-Place for Pasteurization Plants

35 mm. Filmstrip, color, sound, 12 minutes, 63 frames. 1955.

Audience: Sanitary engineers, sanitarians, and dairy science students.

Available: Loan—Public Health Service, Communicable Disease Center, 50 7th St. NE, Atlanta 23, Ga.

The cleaning-in-place method of cleaning milk lines by recirculating a cleaning solution throughout the piping system is the subject of this filmstrip.



This method is represented, through contrast, to be superior to the manual cleaning method, whereby pipes and connections are cleaned individually. A typical installation for the cleaning-in-place method, consisting of the milk line, separate recirculation unit with return line,

and solution tank and pump are shown. In addition, a step-by-step cleaning-in-place operation, from preparation of cleaning solution and checking flow velocity through post-rinsing with lukewarm water and bactericidal treatment of the entire system before starting the milk flow, is followed.

Installed glass and metal cleaning-in-place piping, fittings, gaskets, and welded connections are pictured. Among the check-points depicted are removable fittings, slopes and supports of pipes, accumulated charts, and the recording thermometer, which gives temperature and circulation time.

### Basic Use of Levels by Sanitarians

35 mm. Filmstrip, color graphics, 8 minutes, 45 frames. 1954.

Audience: Sanitary engineers and sanitarians.

Available: Loan—Public Health Service Communicable Disease Center, 50 7th St., NE, Atlanta 23, Ga. Purchase—United World Films, Inc., 1445 Park Avenue, New York 29, N. Y.

The basic uses of engineer's, string, carpenter's, and hand levels and the transverse hose filled with water are pictured in this filmstrip.

To accomplish this, the installation of a septic tank is demonstrated. A specific demonstration relates to the grade board in one section of a drain field. Any one of the five methods demonstrated can give satisfactory results if sufficient time and

care are taken. A knowledge of the use of at least one instrument is essential in sanitation work.

### Serving Food

16 mm. Film, color, 10 minutes. 1954.

Audience: Sanitarians and public health workers.

Available: Loan—Public Health Service, Communicable Disease Center, 50 7th St., NE, Atlanta 23, Ga. Purchase—United World Films, Inc., 1445 Park Avenue, New York 29, N. Y.

The fundamentals of orientation and induction training to be given a waitress by a restaurant hostess are stressed in this film.

Correct ways of clearing tables and the proper storage of cups, dishes, and glasses are por-



The waitress avoids touching the rims of glasses to protect herself and the customers.

trayed. Safeguarding against disease through the development of satisfactory personal habits and periodic physical examination are advocated to protect the health of the waitress as well as the customer.

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- No. 27. Roof rats in southwest Georgia by Dean H. Eeke. Public Health Service Publication No. 373. *See also* Summary article, *Public Health Reports*, April..... 413
- No. 28. Tularemia in sheep and in sheep-industry workers by William L. Jellison and Glen M. Kohls. Public Health Service Publication No. 421. *See also* Summary article, *Public Health Reports*, July..... 720
- No. 29. Cancer morbidity in the United States by Harold F. Dorn and Sidney J. Cutler. Public Health Service Publication No. 418. *See also* Summary article, *Public Health Reports*, July..... 721
- No. 30. Major causes of illness and of death in six age periods by Selwyn D. Collins, Josephine L. Lehmann, and Katharine S. Trantham. Public Health Service Publication No. 440. *See also* Summary article, *Public Health Reports*, September..... 857
- No. 31. Illness and mortality among infants in the first year of life by Selwyn D. Collins, Katharine S. Trantham, and Josephine L. Lehmann. Public Health Service Publication No. 449. *See also* Summary article, *Public Health Reports*, October..... 1026
- No. 32. A historical study of first admissions to a State mental hospital by Morton Kramer, Hyman Goldstein, Robert H. Israel, and Nelson A. Johnson. Public Health Service Publication No. 445. *See also* Summary article, *Public Health Reports*, November..... 1135
- No. 33. Survey and appraisal methods for community fly control programs by H. E. Schoof. Public Health Service Publication No. 443. *See also* Summary article, *Public Health Reports*, November..... 1137
- No. 34. Housing rehabilitation and enforcement of housing laws by Ralph J. Johnson and Roy O. McCaldin. Public Health Service Publication No. 451. *See also* Summary article, *Public Health Reports*, December..... 1247
- No. 35. A study of selected home care programs by Alice M. Waterhouse, Eleanor C. Bailey, Mary C. Gillis, and Jeanne T. Palmer. Public Health Service Publication No. 447. *See also* Summary article, *Public Health Reports*, December..... 1249

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ERRATUM: For line 10 under table 1, column 2, page 618, July issue, "were taken, positive identification of loose sur~" substitute: "its decay products to produce a constant emis~"

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## *X-raying the Heart Cycle*

**BETHESDA, MD.** With the new cardioerontgen actuator, literally a complex trigger for X-ray machines, the taking of X-rays at known times in the heart cycle need no longer be a matter of guesswork.

Superior diagnosis and treatment of heart ailments can often hinge on the cardiologist's sure knowledge that each successive X-ray picture to be compared, sometimes taken years apart, was shot at exactly the same instant in the heart cycle. The ever-changing normal heart volumes and the subtle enlargements of sick hearts are variables that frequently

deserve precise identification and correlation before two X-ray films can be truly compared.

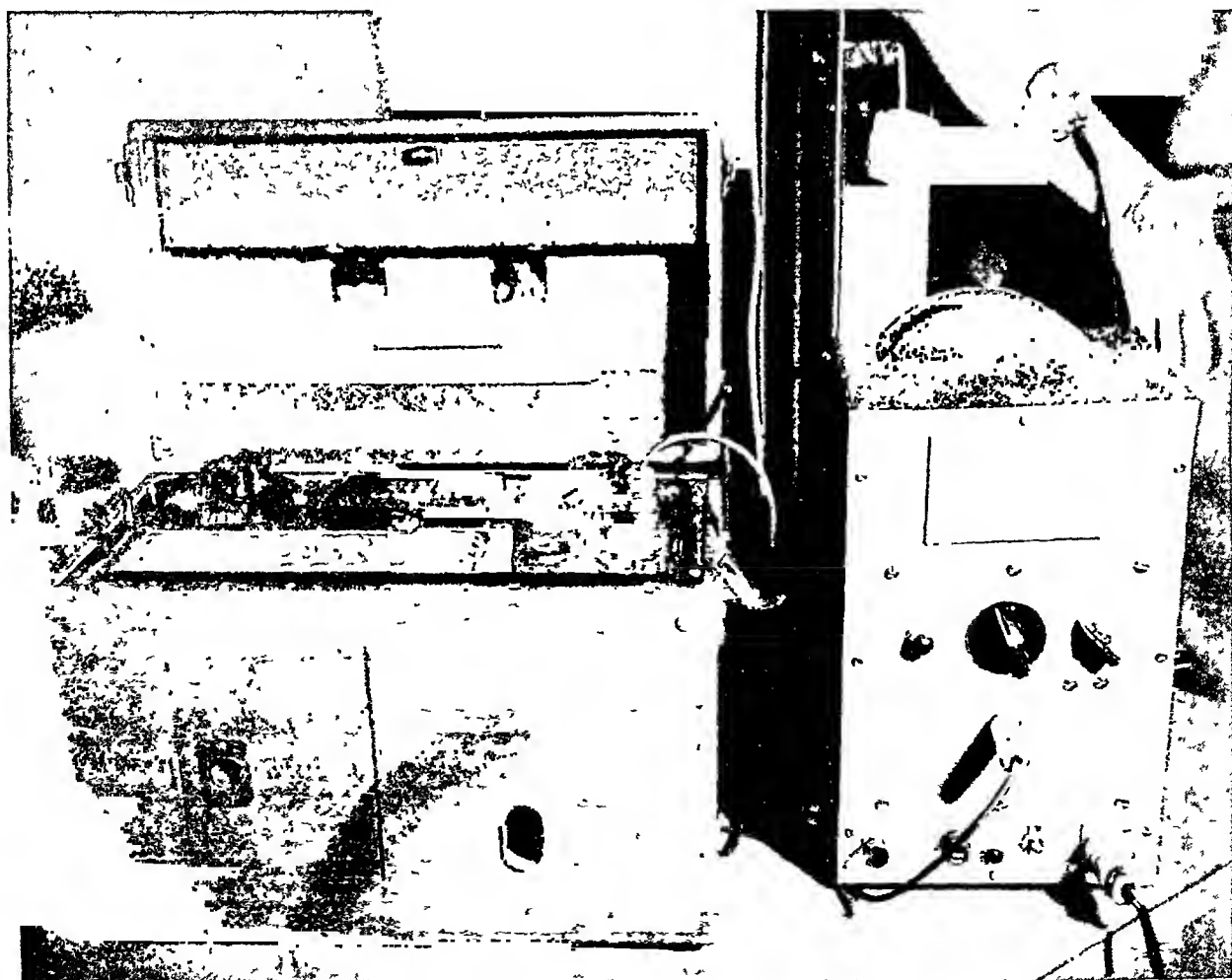
With the new instrument developed by the Public Health Service at the Laboratory of Technical Development, National Heart Institute, the cardiologist can be assured specific mechanical help in this endeavor.

The photograph illustrates the operation of the instrument. The actuator, housed in a special control box (right) operates in conjunction with a conventional electrocardiograph (left) that continuously traces the heart's electrical activity. This activity is correlated with the expansion and contraction of the heart. The electrocardiographic signal triggers the X-ray exposure at any selected time in the heart cycle.

A monitoring photo cell, hanging

below the patient's elbow in the background of the photograph, detects the X-ray exposure and feeds an electrical pulse back into the electrocardiographic curve, marking the exact instant of exposure. A calibrated switch on the actuator permits proper time selection with respect to heart rate so that films can be taken at full expansion, full contraction, or at any intermediate time. In addition, the instrument contains a provision to prevent double exposure.

The actuator is not yet commercially available. A circuit diagram showing the wiring of the instrument and detailed technical information may be obtained from Dr. Bert R. Boone, chief, Laboratory of Technical Development, National Heart Institute, National Institutes of Health, Public Health Service, Bethesda 14, Md.



*In preliminary studies, human body lice maintained in the laboratory for many generations on lindane, Lauseto neu, and the pyrethrins developed much less resistance to these insecticides than has been developed to DDT. The lice developed no resistance to a pyrethrum-sulfoxide compound after 30 generations.*

## Resistance of Human Body Lice to Insecticides

By GAINES W. EDDY, M.S., M. M. COLE, B.S., MAX D. COUCH, B.S.,  
and ALLEN SELHIME, B.S.

THAT INSECTS can develop resistance to insecticides has been known for approximately 50 years. However, the subject has been studied extensively in this country only during the last 6 years, following the development of resistance to DDT by houseflies. The literature on the development of insect resistance to insecticides has been reviewed by Babers (1) and Babers and Pratt (2). Several important references are given in the Yearbook of Agriculture for 1952.

The laboratory of the Entomology Research Branch of the United States Department of Agriculture conducted research at Orlando, Fla., from June 1951 to August 1954 on the resistance of the human body louse, *Pediculus humanus humanus* L., to DDT, lindane, Lauseto neu (chloromethyl *p*-chlorophenyl sul-

fone), pyrethrins, and pyrethrins plus sulfoxide (*n*-octyl sulfoxide of isosafrole).

Lindane, Lauseto neu, and pyrethrins were selected for study because of their general effectiveness against both normal and DDT-resistant lice. Lindane is of special interest because it has been adopted by the Armed Forces for the control of body lice in areas where resistance to DDT has developed.

The experimental development of resistance has usually been accomplished under laboratory conditions by selection. A concentration of toxicant that will cause moderate to high mortality is used, and the survivors serve as parents of the next generation. In some of the Orlando studies reported here the lice were exposed to very light deposits of insecticides which caused no apparent mortality or injury. The dosages varied with the insecticides, but most of them were approximately one-tenth those usually required to give a low mortality or moribundity.

### Previous Reports on DDT Resistance

A number of workers in the field and in the laboratory have reported on the development of DDT-resistant lice. Bushland and associates in 1945 (3) and Eddy and Bushland in 1948 (4) demonstrated that cloth impregnated

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